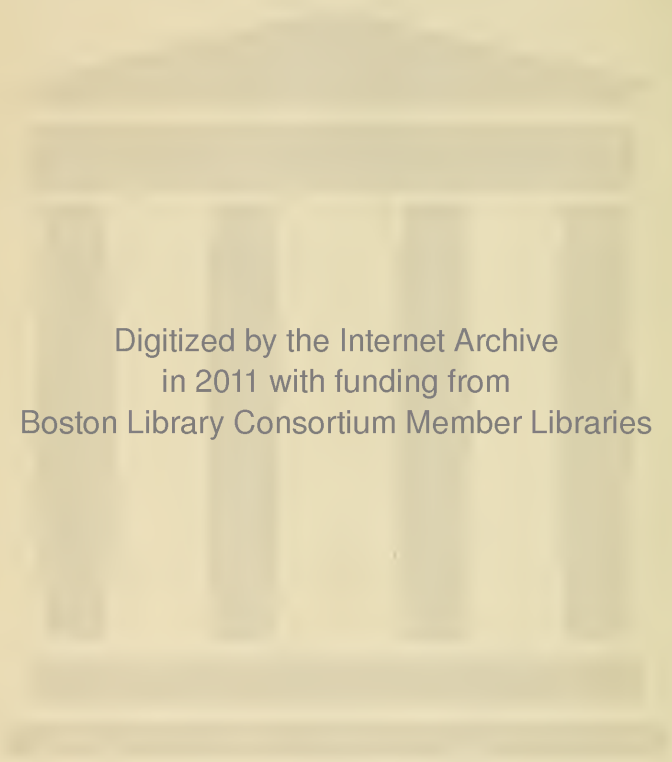

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NORTHEASTERN UNIVERSITY 1975-77
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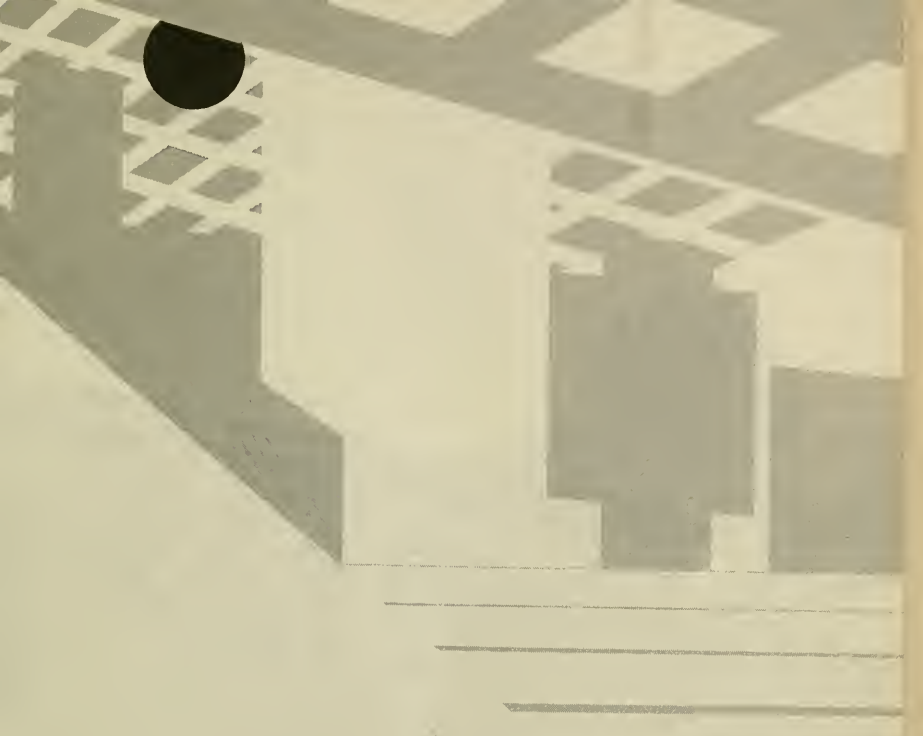

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NORTHEASTE UNIVERSIT

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MAP REFERENCE	Building	Building Designation
F6	Barletta Natatorium	BN
F10	Botolph Building	BT
E6	Cabot Physical Education Ctr.	CB
G7	Churchill Hall	CH
A6	Cushing Hall	CU
H6	Dana Research Center	DA
F5	Dockser Hall	DK
E9	Dodge Library	DG
G8	Ell Student Center and Alumni Auditorium	EC EL
F8	Forsyth Building	FR
G6	Forsyth Building Annex	FA
G5	Greenleaf Building	GR
F4	Hayden Hall	HA
F7	Hurtig Hall	HT
G10	Cahners Hall	CA
B6	Knowles Center (Volpe)	KV
E4	Knowles Center (Gryzmish)	KG
E4	11 Leon Street	UO
J3	African-American Institute	AF
H3	Mugar Life Sciences Building	MU
F9	Parker Building	PA
F3	Richards Hall	RI
E7	Robinson Hall	RB
H9	United Realty Building	UR
G5		

Office Hours at Huntington Avenue Campus, Boston

June 16, 1975 — June 17, 1977

Monday-Thursday ..... 8:30 A.M.-8:30 P.M.
Friday ..... 8:30 A.M.-4:30 P.M.

Program Counseling at Suburban Campus, Burlington

Representatives from the Huntington Avenue Campus will be in attendance during specified dates for guidance and counseling. The bookstore and the Bursar's Office are open from 8:30 a.m.-8:30 p.m., Monday-Thursday; 8:30 a.m.-7:00 p.m. Friday; and 8:30 a.m.-12:00 p.m., Saturday.

Program Counseling at Extensions

Program counselors are available on a regular schedule at Lincoln College extensions at: the Wyman Junior High School, Burlington; the North High School, Framingham; the North High School, Weymouth; the English High School, Lynn; the Junior High School North, Norwood; and the Norwood Airport, Norwood. Appointments may be arranged by telephoning the Lincoln College office at 437-2500.

Interviews

Prospective students, or those desiring advice or guidance regarding any part of the school work or curricula, are encouraged to arrange for personal interviews. Career planning through competent guidance provides an understanding of professional requirements and develops that definiteness of purpose so vital to success. Lincoln College Office is located at 219 Hayden Hall at the Boston Campus.

Address communications to:

William F. King, Director
Lincoln College
Northeastern University
360 Huntington Avenue
Boston, Massachusetts 02115
Telephone 437-2500

1975–1976 ACADEMIC CALENDAR

Fall Quarter 1975

Classes Begin Monday, September 29, 1975

FALL REGISTRATION DATES

Boston	5:30–8:00 p.m.	Monday–Friday, September 8–12
Boston	9:00 a.m.–12 noon	Saturday, September 13
Boston	5:30–8:00 p.m.	Monday–Thursday, September 15–18
Burlington	5:30–8:00 p.m.	Monday–Thursday, September 15–18
Burlington	12 noon–8:00 p.m.	Tuesday, September 16
Boxford (Masconomet) Framingham North H. S. Haverhill H. S. Lynn English H. S. Norwood Jr. H. S. North Revere H. S. Weymouth North H. S.	5:30–8:00 p.m.	Tuesday, September 9 and Monday, September 15
Milford H. S.	5:30–8:00 p.m.	Monday, September 8 and Monday, September 15
Fall Quarter Classes Begin		Monday, September 29
Columbus Day Observed	No Classes	Monday, October 13
Veterans' Day Observed	No Classes	Tuesday, November 11
Thanksgiving Recess	No Classes	Thursday–Saturday, November 27–29
Final Examination Period For Fall Quarter		Monday, December 15–Saturday, December 20

Winter Quarter 1975–1976

Classes Begin Monday, January 5, 1976

WINTER REGISTRATION DATES

Boston	5:30–8:00 p.m.	Monday–Friday, December 8–12
Boxford (Masconomet)	5:30–8:00 p.m.	Tuesday, December 9
Burlington	5:30–8:00 p.m.	Monday–Thursday, December 8–11
Framingham North H. S.	5:30–8:00 p.m.	Monday–Thursday, December 8–11
Haverhill H. S.	5:30–8:00 p.m.	Monday and Tuesday, December 8–9
Lynn English H. S.	5:30–8:00 p.m.	Monday and Wednesday, December 8 and 10
Milford H. S.	5:30–8:00 p.m.	Monday and Tuesday, December 8–9
Norwood Jr. H. S. North	5:30–8:00 p.m.	Monday–Wednesday, December 8–10
Revere H. S.	5:30–8:00 p.m.	Tuesday and Thursday, December 9 and 11
Weymouth North H. S.	5:30–8:00 p.m.	Monday–Thursday, December 8–11
Christmas Vacation	No Classes	Monday, December 22–Saturday, January 3

Winter Quarter Classes Begin		Monday, January 5
Martin Luther King Day Observed	No Classes	Thursday, January 15
Washington's Birthday Observed	No Classes	Monday, February 16
Final Examination Period for Winter Quarter		Monday, March 22–Saturday, March 27

Spring Quarter 1976 Classes Begin Monday, April 5, 1976

SPRING REGISTRATION DATES

Boston	5:30–8:00 p.m.	Monday–Friday, March 15–19
Boxford (Masconomet)	5:30–8:00 p.m.	Tuesday, March 16
Burlington	5:30–8:00 p.m.	Monday–Thursday, March 15–18
Framingham North H. S.	5:30–8:00 p.m.	Monday–Thursday, March 15–18
Haverhill H. S.	5:30–8:00 p.m.	Monday and Tuesday, March 15 and 16
Lynn English H. S.	5:30–8:00 p.m.	Monday and Wednesday, March 15 and 17
Milford H. S.	5:30–8:00 p.m.	Monday and Tuesday, March 15 and 16
Norwood Jr. H. S. North	5:30–8:00 p.m.	Monday–Wednesday, March 15–17
Revere H. S.	5:30–8:00 p.m.	Tuesday and Thursday, March 16 and 18
Weymouth North H. S.	5:30–8:00 p.m.	Monday–Thursday, March 15–18
Spring Recess (or Make-Up Period for Lost Snow Days)		Monday, March 29–Saturday, April 3
Spring Quarter Classes Begin		Monday, April 5
Patriot's Day Observed	No Classes	Monday, April 19
Memorial Day Observed	No Classes	Monday, May 31
Final Examination Period for Spring Quarter		Tuesday, June 14–Monday, June 19
Commencement		Sunday, June 20

Summer Quarter 1976 Classes Begin Monday, June 28, 1976

REGISTRATION FOR ENTIRE SUMMER QUARTER

Boston	5:30–8:00 p.m.	Monday–Friday, June 7–11
Burlington	12 noon–8:00 p.m.	Tuesday, June 8
Summer Quarter Classes Begin		Monday, June 28

REGISTRATION FOR SECOND SIX-WEEK TERM

Boston	5:30–8:00 p.m.	Monday and Tuesday, July 26 and 27
Burlington	5:30–8:00 p.m.	Monday, July 26
Independence Day Observed	No Classes	Monday, July 5
Labor Day Observed	No Classes	Monday, September 6
Final Examination Period for Summer Quarter		Monday, September 13–Thursday, September 18

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admission, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or physical or mental handicap. In addition, Northeastern takes affirmative action in the recruitment of students and employees.

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the university

Founded in 1898, Northeastern University is incorporated as a privately endowed, nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature, by special enactment, has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of more than 150 distinguished business and professional men and women.

From its beginning Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964), Boston-Bouvé College (1964), the College of Criminal Justice (1967), and by Lincoln College's Engineering Technology Programs (1971). As an educational method the Cooperative Plan enables students to gain valuable practical experience as an integral part of their college programs, and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, mathematics, actuarial science, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. Since 1906 evening curricula have been offered leading to the bachelor's degree. Programs in the arts and sciences, engineering, various fields of business, law enforcement and security, and other areas have been carefully planned to serve mature students who are employed full-time during the day and want to broaden their educational background by part-time study. All formal courses of study leading to degrees through evening programs are approved by the Basic College faculties concerned and are subject to the same quantitative and qualitative standards as the regular day curricula.

UNDERGRADUATE COLLEGES

Boston-Bouvé College

Boston-Bouvé College offers four major programs of study: physical education, recreation education, and health education, all leading to the degree of Bachelor of Science in Education; and physical therapy, leading to the degree of Bachelor of Science in Physical Therapy.

The combined programs of liberal arts, science, and professional preparation include field experience and student teaching, and leadership training in camping and outdoor education at the Warren Center for Physical Education and Recreation in Ashland. In accordance with Northeastern's Cooperative Plan of Education, students are offered varied opportunities for alternate terms of work-study experience during upperclass years.

The College of Business Administration

The College of Business Administration offers programs of study in the principal fields of business leading to the degree of Bachelor of Science in Business Administration. These programs are offered on the five-year Cooperative Plan, under which students gain substantial practical experience in the fields for which they are preparing as an integral part of their undergraduate course of study.

The College also sponsors a Management Institute which offers various special courses for business and industrial executives. One phase of the Institute's work is carried on by the Center for Management Development, which annually conducts an intensive program designed to provide professional growth for middle-management executives who will ultimately be called upon to carry broader executive responsibilities. The plan of instruction, based on a modification of the Northeastern Cooperative Program, permits the participants to maintain their job responsibilities during the six-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Andover Academy.

College of Criminal Justice

The College of Criminal Justice offers full-time day curricula on the Cooperative Plan leading to the degree of Bachelor of Science.

The College of Education

The College of Education offers programs leading to the degree of Bachelor of Science in Education. These are particularly designed to meet the needs of high school graduates who desire to prepare them-

selves for teaching or administrative positions in elementary and secondary schools. Curricula are offered on the five-year Cooperative Plan, which provides for employment in libraries, social service agencies, and school systems.

College of Engineering

The College of Engineering offers five-year cooperative curricula in civil, mechanical, electrical, chemical, and industrial engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. The College also offers a general engineering program, awarding an unspecified Bachelor of Science degree, in which the student has the opportunity to design his own program with his career objectives in mind. A six-year program in power systems engineering in collaboration with public utilities leads to both the bachelor's and master's degree in electrical engineering. During evening hours part-time programs leading to the Bachelor of Science degrees in Electrical Engineering and Civil Engineering are conducted. These programs extend over eight years, cover the identical courses given in the day cooperative curriculum, and meet the same qualitative and quantitative standards of scholarship.

College of Liberal Arts

The College of Liberal Arts offers majors in the arts and sciences leading to the degree of Bachelor of Arts. With the exception of preprofessional programs, curricula are normally five years in length and operate on the Cooperative Plan.

Lincoln College

Lincoln College offers engineering technology programs leading to the Associate in Engineering, the Associate in Science, and the Bachelor of Engineering Technology degrees. These programs are made available as:

(a) A full-time day curricula on the Cooperative Plan leading to the degree of Bachelor of Engineering Technology (B.E.T.) in Mechanical or Electrical Engineering.

(b) A part-time evening program including pretechnology preparatory courses and degree programs leading to the Associate in Engineering (A.E.); and the Bachelor of Engineering Technology (B.E.T.) in Civil, Mechanical, or Electrical Engineering. The Associate in Science degree may be earned in the Mathematical, Physical, and Chemical Sciences.

(c) Lincoln College part-time students whose work schedule does not permit them to attend regular evening classes may register for a maximum of 8 quarter hours of course work per quarter in the Lincoln College Day Program.

Registration materials will be available Monday through Friday in Room 219 Hayden Hall, Boston Campus only, during the week preceding the start of each quarter. The day class schedule will not be available at other campus locations. The Registrar will not accept registration materials for day classes without the approval of the Director of Lincoln College. Tuition will be billed at normal evening part-time rates.

Interested students should consult course listing (page 164) to determine equivalent day courses.

The day B.E.T. program is designed to meet the needs of the high school graduate or the student transferring from a community college or technical institute and who desires the full-time day curricula on the Northeastern Cooperative Plan.

In addition to its traditional curricula, Lincoln College Evening School offers interdisciplinary and certificate programs providing technological and professional development opportunities to meet special needs of the part-time student. These programs are designed to provide trained people for ready assimilation by the engineering field and to prepare students for the challenge of interfacing technology and society.

Recognizing the increasing need for higher levels of technical efficiency in fire investigation, fire prevention, and fire protection, Lincoln College, in collaboration with local firefighting agencies, has designed a part-time evening program leading to an Associate in Science degree in Fire Technology. The curriculum includes a broad spectrum of those science technologies which are basic in coping with the firefighting problems attendant to the complexities of today's society.

College of Nursing

The College of Nursing offers two separate and distinct programs of study, both organized on the Cooperative Plan:

(a) A three-year curriculum in preparation for the R.N. Examinations leading to the Associate in Science degree.

(b) A five-year curriculum also preparing students for the R.N. Examinations, and leading to the degree of Bachelor of Science in Nursing.

Five of Boston's leading hospitals — Beth Israel, Children's Hospital Medical Center, New England Deaconess, Peter Bent Brigham, and Massachusetts General — collaborate with Northeastern by providing suitable cooperative work opportunities during the upperclass years of these programs.

College of Pharmacy and Allied Health Professions

The College of Pharmacy and Allied Health Professions offers five-year cooperative curricula leading to the degree of Bachelor of Science in Pharmacy, and to the Bachelor of Science degree with majors in medical laboratory science (medical technology, cytotechnology, hematology), medical record administration, and management in health care agencies and institutions. Associate degree programs are offered in medical laboratory science, respiratory therapy, dental hygiene, and cytotechnology. The College has academic responsibility and, in cooperation with the medical schools and teaching hospitals in the Boston area, offers the professional program for physician assistants.

University College

University College, so called because it draws upon the resources of the other colleges of the University, offers part-time programs in Liberal Arts, Business Administration, Law Enforcement, Education, and Health, leading to the Associate in Science, Bachelor of Arts, and Bachelor of Science degrees. It does not duplicate the offerings of the day college, but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adult students. Students may pursue a degree or simply take courses, based on needs and interests, up to a total of forty quarter hours of credit. Courses are offered in Boston as well as at Boxford, Burlington, Framingham, Lynn, Haverhill, Milford, Weymouth, and several other convenient locations.

Adult Day Programs refers to University College courses that are offered Monday through Friday, 9:00 a.m. to 5:00 p.m., to meet the needs of adults with family or other obligations who wish to engage in part-time study during the day. In addition to the daytime offering of regular University College credit courses, Adult Day Programs also offers daytime workshops and conferences, sometimes over weekends, with the option for credit. Adult Day Programs are offered primarily on the Boston and Burlington campuses, with a limited number of courses offered at other off-campus locations.

Students may enroll as degree candidates or elect single courses appropriate to their needs and interests. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and other off-campus locations near Boston.

GRADUATE SCHOOLS

Actuarial Science

Master of Science in Actuarial Science.

Arts and Sciences

The Master of Arts degree may be earned in economics, English, history, political science, psychology, sociology, and social anthropology. The Master of Science degree is available in biology, chemistry, mathematics, and physics. The Master of Science in Health Science and the Master of Public Administration degrees are also offered. In addition, there are programs leading to the Doctor of Philosophy degree in biology, chemistry, economics, mathematics, physics, psychology, and sociology.

Boston-Bouvé College

Master of Science in Physical Education and Master of Science in Recreation Education.

Business Administration

Master of Business Administration.

Criminal Justice

Master of Science in Criminal Justice.

Education

Master of Education, Doctor of Education, and the Certificate of Advanced Graduate Study.

Engineering

Master of Science with course specification, including a special six-year program in Power Systems Engineering leading to both bachelor's and master's degrees in Electrical Engineering; a similar six-year program in Mechanical Engineering leading to both bachelor's and master's degrees; the Master of Science degree in Civil Engineering; master's degrees in Industrial Engineering and Engineering Management; the professional Engineer degree in Electrical Engineering; the Doctor of Engineering degree in Chemical Engineering; and the Ph.D. degree in the Electrical, Chemical, Civil, and Mechanical Engineering. In addition, the intermediate degree of Engineer is offered.

Law

The School of Law offers a full-time program of professional instruction leading to the degree of Juris Doctor (J.D.). The three-year curriculum includes twelve months of experience in law offices. There are no courses for part-time or evening students.

Pharmacy and Allied Health Professions

Master of Science with specialization in Hospital Pharmacy, Industrial Pharmacy, Medical Chemistry, Pharmacology, Medical Laboratory Science, and Doctor of Philosophy in Medical Chemistry.

Professional Accounting

A five-quarter curriculum leading to the degree of Master of Science in Accounting.

Some of these programs are offered on the Cooperative Plan; others provide teaching and research fellowships for able candidates. The graduate schools are under the jurisdiction of the basic college deans.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

OFFICE OF EDUCATIONAL RESOURCES

The Office of Educational Resources exists to provide (1) facilities and services that enhance student learning; (2) instructional services and equipment that assist faculty in providing efficient and effective instruction; and (3) research and development directed toward the ultimate implementation of empirically tested instructional systems and innovations. The Instructional Systems Analysis Group, a Special Projects Group, and three divisions — Programmed Learning, Instructional Media, Instructional Communications — carry out the objectives.

Of particular student interest is the Center for Programmed Study located in 211 Dodge. There, students study courses taught via self-instructional programs, use programs to supplement course work, fulfill course prerequisite requirements, pursue remedial or review knowledge, or study just for fun. Each student's activity and progress is constantly monitored; faculty assist when content problems arise. The Instructional Materials Information Center provides a central facility and clearinghouse concerning state-of-the-art information on educational technology and innovations, and houses instructional materials from preschool through graduate levels such as texts, programs, activity boxes, slides, filmstrips, illustrations, motion pictures, laboratory kits, simulations, models, video and audio tape, teacher's manuals, curriculum guides, research reports, standardized tests, and other instructional support materials.

DAY PROGRAMS FOR ADULTS

These programs were developed to meet the needs of adults who wish to engage in part-time study during the day only. Noncredit courses and undergraduate and graduate degree programs are offered at the Boston and Burlington campuses. Included are courses from the Graduate School of Education, the Graduate School of Arts and Sciences, University College, and the Center for Continuing Education. A Human Relations and Adult Counseling Program is also offered.

AFFILIATED PROGRAMS

For Dental Hygienists

The Forsyth School for Dental Hygienists conducts a two-year program of dental hygiene education and general education in cooperation with Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the degree of Associate in Science from Northeastern University. After receiving the Associate degree, students may pursue the Bachelor of Science degree from University College on a part-time basis.

Aviation Technology

Lincoln College, in collaboration with Wiggins Airways, Inc., conducts full-time day programs in Aviation Technology in which the student earns the Associate in Science degree and may become licensed by the Federal Aviation Administration with commercial, instrument, and instructor pilot ratings.

Medical Record Science

The University, in affiliation with several area hospitals, offers a three-year program leading to certification in Medical Records Science for students who already hold a bachelor's degree and wish to qualify for the professional examination leading to registration as a record librarian.

For Medical Technologists, Cytotechnologists, Hematologists

In cooperation with the New England Baptist and the New England Deaconess Hospitals, Northeastern University offers a full-time day program on the Cooperative Plan leading to the degree of Bachelor of Science.

Bachelor of Science degree programs in Medical Technology, Cytotechnology, and Hematology are offered on a part-time basis by University College in cooperation with several approved hospital schools.

For Nurses

Northeastern University offers instruction in the sciences, humanities, and social studies for student nurses from the New England Deaconess and Children's Hospital Medical Center Schools of Nursing.

Physician Assistant

In cooperation with the Massachusetts Medical Society, Northeastern offers an 18-month program for the primary care physician assistant. Clinical rotations, supplemental to courses taken on campus, take place at Boston-area hospitals.

For Radiologic Technologists

University College, in collaboration with more than fifty A.M.A.-accredited Hospital Schools of Radiologic Technology located in the New England area, conducts a program leading to certification as a registered Radiologic Technologist (R.T.) and the Associate in Science degree.

For Respiratory Therapists

This program is conducted by University College and the College of Pharmacy and Allied Health Professions in affiliation with local hospitals.

buildings and facilities

Location of Main Campus

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 47 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Some are interconnected by underground passageways.

Carl S. Ell Student Center

The Carl S. Ell Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

The University Library

The Dodge Library is the main library on the Boston campus and maintains an open-stack system. Bound volumes in the library system exceed 360,000, and microform titles, 267,000. Collections are located in these areas:

1. The General Collection in the book stacks as indicated by the classification number given in the upper left corner of the catalog card.

2. The Reference Collection in the Cabot Reading Room to the left of the circulation desk, which includes bibliographies, maps, company publications, the pamphlet file, and association publications. Theses, under the supervision of the Reference Dept., are housed in the basement and should be requested in the Reference Room.

3. The Periodical Collection in the Webster Reading Room to the right of the circulation desk, consisting of current periodicals, periodical indexes, and abstracts, with two stack levels adjacent for back files of bound volumes. The Microfilm Collection in Room 108, adjacent to the Webster Reading Room.

4. The Reserve Book Collection on the second floor.

5. The Foreign Literature Collections in the Webster Reading Room to the right of the circulation desk.

6. The collections of fine arts, housed in the Richardson Room on the second floor. The audio facility for spoken and music recordings and magnetic tapes for instructional and individual use also located in this room.

7. The American and English Literature Collections in the Literature Reading Room.

8. Government documents maintained on the basement level.

There are also book catalogs of the collections in the library at Norwood Airport, Math/Psychology Library, Chemistry Library, and in both the Documents and Reserve Book Rooms. There is an information desk in the Reserve Book Room to assist people in using the card catalog during the day.

The Circulation Department has a printed list of all materials charged out, which may be consulted by all users. To borrow materials, University identification must be presented. For extensive research, where the University Library does not have the material, application should be made to the Inter-Library Loan Librarian for materials needed from other libraries. Information service is available in this department in the evenings.

Library Hours—Boston Campus

	Regular	Reference and Periodical Only
Monday—Thursday	7:45 a.m. to 10:00 p.m.	10:00 p.m.—12:00 p.m.
Friday	7:45 a.m. to 7:30 p.m.	7:30 p.m.—10:00 p.m.
Saturday & Sunday	1:00 p.m. to 5:00 p.m.	12:00 p.m.— 1:00 p.m. 5:00 p.m.—10:00 p.m. 5:30 p.m.—12:00 a.m. (Sundays)

The University Library System includes three graduate libraries in the Division of Research. Physics-electrical engineering is housed in 325 Dana Research Center. Mathematics-psychology is housed on the fifth floor of the United Reality Building and chemistry is located on the first floor of Hurtig Hall.

Library Hours—Suburban Campus, Burlington

Monday—Thursday	8:30 a.m.—9:00 p.m.
Friday	8:30 a.m.—7:00 p.m.

Library will be open every other Saturday 1:00 p.m.—5:00 p.m.

Cabot Physical Education Center

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. It contains four basketball courts, an athletic cage, a women's gymnasium, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouvé College.

A recent addition to the Center, the Barletta Natatorium, houses a 105-foot swimming pool, a practice tank for the crew, handball courts, and shower and dressing facilities.

Dockser Hall

Charles and Estelle Dockser Hall, completed in 1968, houses a large gymnasium, dance studio, motor performance laboratory, college library, community recreation laboratory, folk arts center, dark and music rooms, recreation resources area, locker rooms, offices, classrooms, conference room and lounge, storage facilities, and a research laboratory.

SUBURBAN FACILITIES

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults and non-credit state-of-the-art programs are offered.

Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is twelve miles from the main campus.

Warren Center

The Warren Center for Physical Education and Recreation in Ashland, Massachusetts, serves as a year-round outdoor laboratory for students in Boston-Bouvé College. There are facilities for conferences, special education in arts and crafts, and sports—including aquatics. Buildings include a lodge, cottages, and an infirmary.

Marine Science Institute

The Marine Science Institute at Nahant, Massachusetts, about 20 miles northeast of Boston, is a research and instruction facility engaged primarily in studies of marine biology and oceanography. The Institute is operated the year around.

lincoln college administration

Administrative Officers

William F. King, B.S., M.S., P.E.
Director

Jacob Wiren, B.S., M.S., P.E.
Assistant Director

Hollis S. Baird
Assistant to the Director

Otis F. Cushman, B.S., M.S.
Assistant Director

Student Counseling Staff

Hollis S. Baird
Administrative Coordinator

Robert J. Averill, B.S., M.S.
Philip W. Dunphy, B.S., M.Ed.
Charles F. Field, B.S., M.Ed.
Roderic W. Sommers, B.S., M.Ed.
Richard E. Sprague, B.S., B.B.A., M.B.A., Ed.M.
Jacob Wiren, B.S., M.S., P.E.
Kenneth S. Woodward, B.S., M.S.

Committee on Regulations and Discipline

William F. King, *Chairman*

Hollis S. Baird
Kenneth S. Woodard
Kenneth C. Solano
Otis F. Cushman
Kenneth W. Ballou
President, Adult Student Council

Academic Standing Committee

Otis F. Cushman, *Chairman*

Hollis S. Baird
William F. King
Jacob Wiren
Kenneth S. Woodard

Academic Advisory Council

William F. King, *Chairman*
Jacob Wiren, *Vice Chairman*
Hollis S. Baird, *Secretary*

Leroy M. Cahoon
Otis F. Cushman
Edward M. Cook
Robert S. Lang
Ernest E. Mills
Louis J. Nardone
Thomas H. Wallace
Kenneth S. Woodward

Curriculum Advisory Committee

William F. King, B.S., M.S., P.E.
(Academic Administration)
Chairman
Jacob Wiren, B.S., M.S., P.E.

(continued on following page)

Vice Chairman
Otis F. Cushman, B.S., M.S.
Secretary
Professor Hollis S. Baird

Robert J. Averill, B.S., M.S.
(Circuit Theory)
Edward Bobroff, B.M.E., P.E. (Mass)
(Calculus)
Eugene G. Branca, S.B., S.M.
(Basic Mathematics)
Franklyn K. Brown, B.S., Ed.M.
(Engineering Design)
William O. Bruehl
(Mechanical Engineering Laboratory)
Leroy M. Cahoon, B.S. in C.E., M.S., P.E. (Mass)
(Civil Engineering Technology)
John J. Cochrane, B.S., M.S., Ph.D.
P.E. (Mass, N.Y., Vt.)
(Environmental Technology)
Edward M. Cook, A.B., A.M.
(Mathematics)
Warren C. Dean, A.B., M.A.
(Differential Equations)
Paul A. Dunkerley, B.S., S.M., P.E. (Mass)
(Fluid Mechanics)
William D. Finan, A.B., M.A.
(Introductory Mathematics)
John L. Freedman, B.S., P.E. (Mass)
(Electronics)
David Goldberg, B.S., M.S.
(Electrical and Electronic Graphics)
Arthur F. Gustus, B.S., Ed.M.
(Physics)
Francis R. Hankard, B.S., M.A.
(Physics)
Joseph J. Hansen, A.B., M.B.A.
(Mathematics for Business Management)
George C. Harrison
(Pulse Circuits & Elect. Labs.)
John Kaczorowski, Jr., B.S., M.S.
(Electrical Power Engineering Technology)
Gary M. Keighley, B.S.
(Flight School)
George F. Kent, B.S., M.S., P.E. (Mass)
(Materials)
Horatio W. Lamson, B.S., M.A., P.E. (Mass)
(Electrical Measurements)
Robert S. Lang, B.S., Ed.M.
(Graphics and Computation)
Demetre P. Ligor, B.S.E.E., P.E. (Mass) (Wave Phenomena, Semiconductor Physics & Devices)
Walter Messcher, B.M.E., M.S.
(Computer Programming)
Ernest E. Mills, B.S., M.S., P.E. (Mass) (Mechanical Engineering Technology, Day and Evening)
Louis J. Nardone, B.S., M.S., P.E. (Mass)
(Electrical Engineering Technology, Day and Evening)
Bernard C. Reddy, B.S., Ed.M.
(Introductory Physics)
Harold M. Sharaf, B.S., M.S.
(Principles of Communication Systems)
Thomas H. Wallace, B.S., M.A., Ph.D.
(Physics)
Willard B. Whittemore, B.S., in C.E., Ed.M., C.A.G.S.
(Algebra and Trigonometry)
Albert G. Wilson, Jr., B.S. in C.E., M.S., P.E. (Mass), S.E. (Illinois)
(Statistics and Dynamics)
Kenneth S. Woodard, B.S., M.S.
(Aviation Technology)

Office Staff
Rasma Galins, Administrative Secretary
Ann P. Druke, Secretary
Doris S. Tortora, Secretary
Biljana John, Secretary of Records

the role and scope of lincoln college

Purpose

Lincoln College is charged with the responsibility for developing and offering college-level courses and curricula of an applied-science or technological nature. Its purpose is to assist professional personnel, qualified to deal with the applications and uses of the biological, natural, and physical sciences, in better meeting community needs. The programs of study conducted by the College have in common the following purposes and characteristics:

1. The programs of instruction prepare the graduate for activities allied to the fields of engineering, science, or medicine, but are more specialized than those required to prepare a person for full professional responsibilities.
2. The programs of instruction are more concise and more completely technological in content than professional curricula, though they are concerned with the same general fields of scientific, engineering, industrial, or clinical specialization.
3. The programs of instruction are based upon principles of science, and include post-secondary-school mathematics to provide the tools to achieve the technological objectives of the curricula.
4. Emphasis is placed upon the use of rational processes in converting theories and ideas into practical techniques, procedures, and products.
5. Extensive training for artisanship or craftsmanship is not included within the scope of the technological education programs.
6. Graduates from the associate degree programs have opportunities for educational work leading to the Bachelor of Engineering Technology and Bachelor of Science degrees.

Technology and the Technologist

Scientific and technological skills range over a broad spectrum, from extremely simple craftsmanlike activity to highly complex and abstract activity. At one end of the spectrum is the professional whose work is mostly theoretical in character. He studies, reasons, and visualizes how new knowledge may be used in the development of solutions to technical problems. Usually he is not completely knowledgeable of the detailed procedures used by the skilled craftsman who executes the ideas, procedures, and designs.

The technologist is the pivot-man on the professional-technologist-craftsman team. He works with the professional engineer, scientist, doctor, supervisor, and craftsman in converting knowledge of scientific theories and practical craftsmanship into products, procedures, and techniques. His responsibilities are technologically important—professional opportunities are limited only by ambition, ability, and education.

When employed in research, design, or development, the technologist usually acts as direct supporting personnel to the professionals. If he functions in a capacity related to production, operation, testing, or control, he usually follows a course prescribed by a professional but may not work closely under his direction. If installation, maintenance, or sales are his areas of responsibility, he is frequently performing a task that would otherwise have to be performed by the professional. He thereby assumes the more routine professional functions demanded by our increasingly scientific and technical society.

In executing his functions, the technologist is required to use a high degree of rational thinking, to employ post-secondary school mathematics and the principles of the biological, natural, and physical sciences. The skilled technologist works with his mind as well as his hands. He considers why, as well as how things work. To perform his functions efficiently, the technologist must effectively communicate technical and scientific information mathematically, graphically, and linguistically.

The Need for Technologists

Our present technological age, with its exploding accumulation of new information and discoveries in the physical, natural, and life sciences, has increased the need for people with specialized training in science and technology. Experts have recently estimated that in order to meet expanding needs, the number of students graduating from the nation's professional schools must double—a goal which is improbable in the near future.

The most reasonable alternative is to make our professional manpower most efficient by providing assistance in the form of specially trained technologists. Manpower experts believe that the present ratio of less than one technologist to each professional should ideally be nearer five to one.

Opportunities for technologists are increasing at a faster rate than for any other occupational group—a 50 percent increase is expected in the next five years. More than 200,000 technologists will be needed each year; schools now graduate only 50,000 per year. The technologist's employment opportunities are varied and much demanded in health and public service organizations; atomic energy and electric power industries; metal fabricating industries; local, state, and federal government agencies; the armed forces; aerospace industries; chemical, petroleum, plastics, and metal industries; as well as transportation and communication industries.

PROGRAMS OF INSTRUCTION

Recognizing the growing need for technicians and technologists and their expanding role in modern society, Lincoln College offers Pre-Technology Preparatory Courses and degree programs leading to the Associate in Engineering (A.E.); Associate in Science (A.S.); and Bachelor of Engineering Technology (B.E.T.) as follows:

Pre-Technology

Introductory Mathematics, Basic Mathematics, Physics, and English ..... pages 68-69
Reading-Improvement Program (non-credit) ..... page 70
Programmed Instruction Review Courses (non-credit) ..... page 70

Aviation Technology

Aviation Technology (A.S. degree)—2 years days ..... page 72

Civil Engineering Technology

Architectural Engineering Technology (A.E. degree) ..... page 75
Environmental Engineering (A.E. degree) ..... page 76
Structural Engineering Technology (A.E. degree) ..... page 77
Surveying and Highway Engineering Technology (A.E. degree) ..... page 78
Civil Engineering Technology (B.E.T. degree) ..... pages 79-80

Electrical Engineering Technology

Electrical Power Engineering Technology (A.E. degree) ..... page 82
Electronics Engineering Technology (A.E. degree) ..... page 83
Electrical Engineering Technology (B.E.T. degree) ..... pages 84-86
Electrical Engineering Technology (B.E.T. degree) ..... pages 87-88
(Day Cooperative Curriculum)

Mechanical Engineering Technology

Mechanical Engineering Technology (A.E. degree) ..... page 90
Heat Engineering Technology (A.E. degree) ..... page 91
Mechanical Engineering Technology (B.E.T. degree) .... pages 92-93
Mechanical Engineering Technology (B.E.T. degree) .... pages 94-95
(Day Cooperative Curriculum)

Interdisciplinary Science and Engineering Technology Programs

Chemical-Physical Technology (A.S. degree) ..... page 97
Mathematical-Physical Technology (A.S. degree) ..... page 98
Fire Technology (A.S. degree) ..... page 99
Bioelectronic Engineering Technology (A.E. degree) ..... page 100
Computer Engineering Technology (A.E. degree) ..... page 101
Control Systems Engineering Technology (Certificate) ..... page 102
Environmental Control Technology (B.E.T. degree) .... pages 103-104
Mechanical-Structural Engineering (B.E.T. degree) ..... page 105

College of Engineering

Part-time Electrical, Civil, and Mechanical Engineering Programs (B.S. degree)

These programs are designed for fully qualified young men and women who:

1. because of family responsibilities must continue to be gainfully employed full time during the day, but who wish to advance by devoting leisure time to their own professional development;
2. were in the top half of their high school class, but at graduation were financially unable to continue their education at the college level; those who did not enjoy top-half standing may require refresher study;
3. realize that the most effective way to achieve their full potential in these days of specialization is to earn a college degree.

All of the courses in these part-time curricula are identical with those

offered in the five-year, day cooperative programs and are taught by the same faculty.

The University reserves the right to withdraw, modify, or add to the courses offered or to change the order or content of courses in any curriculum.

Admission Requirements

It is important that applicants for admission to the College of Engineering complete the full sequence of secondary school courses in English, Mathematics, and Science. The following subjects should be included: English (4 years), Physics or Chemistry, Algebra (through quadratics), Plane Geometry, and Trigonometry.

Admission testing requirements may be met in one of three ways:

1. by submitting the results of the College Board Scholastic Aptitude Test previously completed;
2. by writing the College Board Scholastic Aptitude Test during the current year; the Committee on Admissions provides full information about the Scholastic Aptitude Tests;
3. by completing a special battery of tests in the Northeastern University Counseling and Testing Center, Room 302, Ell Student Center.

If a transfer student is applying for advanced standing he need not complete testing.

In evaluating the credentials of applicants, the Committee on Admissions takes into account additional study which may have been completed since secondary school and, where relevant, armed forces experience.

Applying for Admission

Applications for freshman admission and admission with advanced standing may be obtained by writing to the Department of Admissions, 150 Richards Hall, Northeastern University; or they may be secured during an admissions interview.

A personal interview is not required, but all candidates are welcome to make an appointment with an admissions counselor. Interviews may be scheduled from 8:30 a.m. to 4:00 p.m., Monday through Friday, and on Saturday from 9:00 to 11:30 a.m.

The candidate will be notified of the decision of the Committee on

Admissions as soon as all credentials have been received and evaluated.

Candidates who have successfully completed courses at other institutions and who wish to transfer to Northeastern should read the following information concerning special transfer programs.

Civil and Electrical Engineering Transfer Programs for Associate Degree Graduates

Students with an Associate degree from an accredited technical institute, community college, or junior college with a 2.5 cumulative average or better (c=2.0) may be eligible to enter a special transfer program and complete the civil or electrical engineering degree in five years. Students whose associate degree program did not include a minimum of one year of both calculus and physics will not be eligible for entry at this level.

Civil, Electrical, and Mechanical Engineering Transfer Programs for Bachelor of Engineering Technology Graduates

Students with a Bachelor of Engineering Technology degree or its equivalent from an accredited college or university, with a 2.75 cumulative average or better (c=2.0), may be eligible to complete one of the specified bachelor of science in engineering programs by taking a *minimum* of 40 quarter hours (10 courses) of work. The courses to be taken are assigned by a departmental advisor and are based whenever possible on the student's previous background. The average requirement has been 12 courses (48 quarter hours) which can be completed in two years. Students who have a Bachelor of Engineering Technology, Bachelor of Science in Engineering Technology, or a Bachelor of Science in Engineering degree that is not professionally accredited may be required to take significantly more courses.

All Other Transfers

Students with previous academic experience not covered in the above categories will be placed at an appropriate point in the program they select, based on a course-for-equivalent-course credit evaluation.

Questions concerning these programs may be referred to the Department of Admissions (437-2213), or to the Office of the Dean of the College of Engineering (437-2152).

The final date of application will be Friday of the first week in September for the Fall Quarter.

Admission to the Winter and Spring Quarters is limited to transfer students only.

The College Year

Each academic year is composed of three twelve-week quarters, beginning late in September and ending about the middle of June. Full details in regard to registration are mailed approximately one month in advance. The programs are offered only at the Boston Campus.

Tuition

The tuition charge for courses is $54.00 per quarter hour. Students normally carry from five to nine quarter hours each twelve-week quarter.

Schedule of Classes

Class will normally meet two evenings each week, and occasionally on Saturday morning. Laboratory classes meet additional evenings.

admissions information

ADMISSION

The Student Body

The student body of Lincoln College is composed of recent high school graduates and mature men and women. Most students are employed in industry, with vocational experience ranging from very little for the recent secondary school graduate, to as much as twenty or thirty years for individuals seeking increased professional responsibility and status. Many technical career categories are represented—industrial, engineering, scientific, and allied-medical—demonstrating that, in our increasingly complex society, the key to personal advancement is education.

Academic Background

A firm knowledge of the fundamentals of mathematics and science is the foundation upon which successful achievements in the more advanced technological courses are built.

Applicants to Lincoln College are, in many cases, mature adults who, although they have experience in industry or previous education, have been away from formal study for some time and, therefore, have doubts concerning their study habits and their algebra, geometry, and science proficiency. Those who anticipate some difficulty in adjusting to the first-year course requirements are advised to give very serious consideration to enrolling in non-credit courses in introductory mathematics, introductory physics, and/or introductory chemistry. These courses are designed to develop adequate background for the basic courses in the degree programs.

Program Counseling

Career planning through self-analysis and professional counseling assists students in planning educational programs appropriate to their objectives. Entering students are encouraged to arrange for personal interviews with Lincoln College program counselors for assistance in planning their academic programs. Counselors are available by appointment at the Huntington Avenue Campus, Boston; the Suburban Campus, Burlington; the North High School, Framingham; the Wey-

mouth North High School, Weymouth; the Norwood Junior High School North, Norwood; Norwood Airport, Norwood; and the Lynn English High School, Lynn. Students are encouraged to present records of prior education whenever possible. The effectiveness of the counseling review is greatly enhanced by this information. The University, through its Counseling and Testing Center and its Career Information Center, is also prepared to assist applicants whose educational and vocational goals are more complex or less firmly defined.

Application for Admission

Applications for the programs of study offered in the Lincoln College are accepted for admission to the Fall (September), Winter (January), Spring (March), and Summer (June) Quarters. Applications should be filed as early as possible in advance of the opening of the quarter for which the student desires to register in order that eligibility and status may be established.

Information concerning admission may be obtained either by writing to Lincoln College or by requesting it at the time of visiting the College. The application for admission should be completed in detail and submitted to Lincoln College, Northeastern University, Boston, Massachusetts 02115.

All inquiries relative to the Day Cooperative programs should be referred to the Day College Admissions Office, 150 Richards Hall. (See pages 87-88 and 94-95.)

Mathematics Placement Test

Applicants requesting admission to regular first-year mathematics are required to demonstrate proficiency in introductory or basic mathematics through the Lincoln College Mathematics Placement Test. Students who request enrollment in the non-credit Introductory Mathematics course are not required to take the test. The Mathematics Placement Test will be administered during the registration period for each term of instruction at the Huntington Avenue Campus, Boston, and the Suburban Campus, Burlington. The Mathematics Placement Test will be administered on selected dates at the North High School, Framingham; the Weymouth High School, Weymouth; the Lynn English High School, Lynn; and the Norwood Junior High School North, Norwood. In addition, the test is administered during the summer months. Contact the Lincoln College Office, 219 Hayden Hall, at the Boston Campus (437-2500).

Students who demonstrate satisfactory proficiency in the test will be permitted to register for the first-year courses in the program of their

choice. To enroll in Engineering Physics (11.317) the student may need to take Introductory Physics.

If need for a strengthening of mathematical background is indicated, the applicant will be assigned to the Introductory Mathematics course.

Students enrolling in Introductory Mathematics may fill out their schedule by enrolling in Introductory Physics, Introductory Chemistry, or Engineering Graphics.

In every case the student should carefully consider his combined work and study load and register for only those courses which contribute to the development of a firm knowledge of fundamentals and which enable him to adjust to academic study requirements.

CLASSIFICATION OF STUDENTS

Applicants who have filed an Application for Admission and who are approved by the Lincoln College Academic Standing Committee are admitted as regular degree candidate students in the program which they have indicated on the application.

Special Students

Students having specific course needs, who do not desire a degree, may register for the courses if they have the required prerequisites or their equivalent. These students will be enrolled as "special students."

Matriculation

Degree candidates must file a petition for matriculation when they have completed a minimum of forty quarter-hours of work in Lincoln College, for a review of their academic record and to insure that:

1. The student is entered in the permanent record as a degree candidate in the program of his choice;
2. Advanced standing credit for transfer students is entered in their permanent record.

This review will assure that the student has:

1. Attained a satisfactory quality point average;
2. Presented evidence of completion of an accredited secondary school program by submission of a transcript of record or a high school equivalency certificate;

3. Demonstrated acceptable levels of ability and achievement in 15 units* of secondary school and/or collegiate work as follows:

Verbal Communication	4 units
Mathematics and Computation	3 units
Science and Technology	3 units
Other	5 units

4. The Academic Standing Committee may require a student to take one or more aptitude or interest tests if his credentials or academic record fail to completely satisfy the criteria for probable academic success. These tests will be administered by the University Counseling and Testing Center. A fee is charged for these tests.

TRANSFER STUDENTS AND ADVANCED STANDING CREDITS

Students transferring from community colleges, junior colleges, technical institutes, or other colleges and universities may transfer applicable credits toward the degree requirements of Lincoln College.

Students admitted with transfer or advanced standing credits from another institution must meet the requirements for admission as set forth under the regulations applicable to regular students. Advanced standing in Lincoln College may be obtained by (1) transfer of credits or (2) proficiency examination.

Transfer of Credits

Subject to the approval of the Academic Standing Committee, credits may be awarded for academic work completed in other approved schools, colleges, or universities if the following criteria are met: (a) the content of the course being submitted is equivalent to that of the corresponding course in Lincoln College; (b) the average grade achieved in the course submitted is "C" or higher; and (c) the remoteness of the time of study does not negate its use as a prerequisite for an advanced course.

Applicants desiring advanced standing credit by transfer should indicate this desire at the time of filing the application for admission. The applicant should request the Registrar of the institutions of previous attendance to mail an official transcript to the Lincoln College Office.

Proficiency Examinations

Applicants who do not meet all the criteria for the normal transfer of

*A unit represents a year's work in a subject at an approved secondary school, community college, junior college, technical institute, or university.

credits, but who are able to supply evidence of sufficient knowledge of a subject as a result of previous training or experience, may petition the Academic Standing Committee for the privilege of taking a Proficiency Examination. If satisfactory proficiency is indicated by the examination, advanced standing credits may be awarded or a substitute course may be recommended.

Readmission

Former students who seek readmission to continue a program of study after having withdrawn from the College for a period of time, may be required to repeat courses which are prerequisites to advanced work.

REGISTRATION

Registration for Courses

Completion of admission requirements does not constitute official registration for courses. All students must be properly registered before attending classes. Registrations are processed by the Registrar's Office during the official registration periods. Former students should ascertain completion of prerequisite courses before registration. Students may register for full-year sequences of courses during the official registration periods. They are urged to register as early as possible in order to obtain the desired class schedule.

Changes in Registration

Changes in program should be initiated before the opening day of classes during the official registration periods.

Official Registration Periods

Official registration periods are scheduled before the Fall, Winter, Spring, and Summer Quarters during the academic year. Students are urged to register as early as possible during these periods. Dates of registration periods for each quarter are listed in the official 1975-1977 Academic Calendar (see pages 6 and 7).

Withdrawal

Simply ceasing to attend classes or notifying the instructor does not constitute official withdrawal from a course. To withdraw officially from a course, the student must notify the Registrar's Office in writing or complete the appropriate withdrawal form. Properly registered students who do not attend one of the first three sessions in any course will be automatically withdrawn from the class roll.

Courses in Other Departments of the University

Lincoln College students assigned to courses in other departments of the University are charged the tuition rates and other fees effective in the departments in which they are enrolled.

academic information

ACADEMIC OPERATIONS

Campuses and Extensions

All courses are offered at the Huntington Avenue Campus, Boston, with some courses available at the Suburban Campus or Burlington High School, Burlington; and at Masconomet Regional High School, Boxford; North High School, Framingham; Haverhill High School, Haverhill; English High School, Lynn; Milford High School, Milford; North High School, Weymouth; Norwood Junior High School North, Norwood; and for Aviation Technology students at the Norwood Airport, Norwood.

The Quarter Calendar

The regular school year, from September to June, is divided into three quarters of thirteen weeks each. Twelve weeks are scheduled for instruction and final examinations with one week available for makeup classes or vacation time. A limited program of courses is offered during the Summer Quarter.

Class Sessions

At the Huntington Avenue Campus, lecture periods consist of one hour and forty-minute sessions beginning at 4:10 p.m., 6:00 p.m., and 7:50 p.m. each weekday and at 9:00 a.m. or 10:50 a.m. on Saturdays. At the Suburban Campus and Burlington High School, Burlington, lecture periods will begin at 4:10 p.m., 6:00 p.m., and 7:50 p.m. At the North High School, Framingham, lecture periods will begin at 6:15 p.m. and 7:55 p.m. At the North High School, Weymouth; Masconomet Regional High School, Boxford; Lynn English High School, Lynn; Haverhill High School, Haverhill; Milford High School, Milford; Norwood Junior High School North, Norwood; and Norwood Airport, Norwood, lecture periods will begin at 6:00 or 7:50 p.m. each evening. Day sessions at Norwood Airport begin at 8:00 a.m. each morning. Design and laboratory courses are of longer duration and may occupy a full evening. All laboratory courses are conducted on the Huntington Avenue Campus.

Course Work

All the usual methods of instruction are employed—lectures, home assignments, class projects, laboratory work, irregularly scheduled quizzes, and formal examinations. In addition, mid-course examinations are scheduled in most courses and a final examination is required at the completion of all courses. Students are responsible for fulfilling all the requirements of a course. In the event of absence, students must make appropriate arrangements for makeup with the instructor. Students must follow the procedures outlined below for makeup of missed mid-term or final examinations.

Student Study Areas

The UNIVERSITY LIBRARY is well equipped with technical literature. A detailed statement about its facilities and hours appears on pages 27-29.

The privilege of obtaining books from the Boston Public Library is extended to students of Lincoln College. Application for this privilege, which involves a fee, should be made directly to the Boston Public Library.

Additional study areas are available in the Ell Student Center Building.

Attendance

Students absent from regularly scheduled sessions in any subject, for whatever reason, may seriously jeopardize their academic progress and status. Students are expected to be in attendance at all the sessions scheduled in their courses. Excessive absence may be sufficient cause for the Registrar to remove the subject(s) from the student's schedule.

Withdrawal

Simply ceasing to attend classes or notifying the instructor does not constitute official withdrawal from a course. To withdraw officially from a course, the student must notify the Registrar's Office or complete the appropriate withdrawal form.

The Registrar will withdraw the student from a course who:

1. Does not attend one of the first three classes at the beginning of a twelve-week quarter;
2. Does not attend one of the first two classes at the beginning of a summer term.

MAKEUP EXAMINATIONS

Mid-course Examinations

A student absent from a regularly scheduled mid-course examination or quiz may request permission to take a makeup examination. This is a privilege which may be denied if abused by an excessive number of petitions or for other reasons.

Students applying for makeup examinations must:

1. Request from the instructor permission to take the mid-term examination or quiz;
2. The instructor will forward the examination to the Lincoln College Office for processing.

Makeup mid-term examinations and quizzes will be given on a Saturday at 9:00 a.m. in a designated room at the Huntington Avenue Campus according to the published schedule. Contact the Lincoln College Office, 219 Hayden Hall (Telephone 437-2500).

Any student who does not take the makeup examination as scheduled will forfeit the makeup privilege.

Missed Final Examinations

If a student is absent from a final examination, he will receive a grade of "I" (Incomplete) in the course. He may petition for a makeup final examination at the Registrar's Office, 120 Hayden Hall.

A student does not automatically have the right to make up a missed final examination. Students must petition for this privilege. If the petition is granted, the student must pay a $5.00 fee for taking the special final examination. Petitions may be obtained from the Registrar's Office or in each off-campus Administration Office. Petitions for missed finals must be filed in accordance with the published schedule. Contact the Lincoln College Office, 219 Hayden Hall (Telephone 437-2500).

Students will be notified by mail when and where to take the missed final examination. All examinations will be administered on the Boston Campus. Those who do not take makeup final examinations as scheduled forfeit the makeup privilege.

ACADEMIC STANDARDS

The student is required to maintain appropriate levels of academic achievement in terms of grades, quality-point average, and the quanti-

tative credit requirements of his program of study to satisfy academic progress criteria and achieve graduation from Lincoln College.

Grading System

The following system of grading is used. The numerical equivalent for each grade is in parentheses.

A (4.0)—Outstanding
B (3.0)—Good
C (2.0)—Satisfactory
D (1.0)—Poor
F (0.0)—Failure
I (—)—Incomplete
L Audit (No Credit)
S —Satisfactory (Pass-Fail grade)
U —Unsatisfactory (Pass-Fail grade)
X —Incomplete (Pass-Fail grade)
* Grade not received

A general average of "D" is unacceptable and will not allow a student to continue in Lincoln College or to receive a degree from Northeastern University. The "F" grade is a definite failure. The standard procedure for clearing failures in courses offered in Lincoln College is to repeat the course. In some instances circumstances may warrant amending the standard procedure. These circumstances are described in the *Student Handbook* for day students. An "I" or "X" (incomplete) grade is used for a temporary grade to show that the student has not completed the course requirements.

Pass-Fail Courses

Any student who is not on academic probation and who has completed forty quarter hours of academic work may register for one pass/fail course and, thereafter, for one course on a pass/fail basis for each ten quarter hours of successfully completed work. Written permission of the appropriate academic dean must be obtained for each pass/fail course. At no time may a student register for more than one pass/fail course per quarter.

Such courses will be restricted to free electives outside the major field of specialization, so that no part of the specifically prescribed curricula will be affected.

The grades recorded on the basis of the pass/fail system of grading will not figure in the computation of the QPA.

Auditing Policy

Students are permitted to audit courses upon filing the usual registration forms and paying the regular tuition fees. There is no reduction in fees for auditing. An auditor may participate in class discussion,

complete papers and projects and take tests and examinations for informal evaluation, if desired. However, regardless of the amount or quality of work completed, **no academic credit will be granted at any time for courses audited.**

Audit Procedure

The student's decision to take a course on an audit basis must be communicated in writing to the Registrar prior to the fourth class meeting of the course. No exception to this procedure can be approved without authorization by the Academic Standing Committee of the College.

Grade Reports

Grades are mailed to the student by the Registrar and will not be given out at the office of either the Registrar or Lincoln College. Under no circumstances will grades be given over the telephone.

Quality-Point Average

The quality points earned by the student in a given course are determined on the basis of the letter grade achieved and the number of credit hours carried by the course. The total quality points earned, divided by the total number of credit hours, constitute the quality-point average.

1. When the student has more than one grade in the same course, the most recent grade will be used in the calculation of the quality-point average.
2. A grade of "I" will not be considered in the calculation of the final quality-point average.
3. Although advanced standing credits (ASC) allowed for acceptable work completed at other institutions by transfer students count toward completion of the quantitative credit requirements, neither the credits nor the grades earned in such courses are included in quality-point average computations.
4. In programs made up of combined University College and Lincoln College courses, the cumulative quality-point average will include all work in both colleges.

For example, a student who has registered for seven courses, cleared a failure in one of them and received advanced standing credit (ASC) in another, may calculate his quality-point average as follows:

Grade Achieved	Numerical Equivalent	Credit Hours	Quality Points
A	4.0	× 4 =	16.0
B	3.0	× 4 =	12.0
C	2.0	× 3 =	6.0
D	1.0	× 3 =	3.0
F	0.0	× 2 =	0.0
FB	3.0	× 2 =	6.0
I	—	× — =	—
IC	2.0	× 2 =	4.0
ASC	—	× — =	—
		Totals 20	47.0

$$\text{Quality-Point Average} = \frac{\text{Total Quality Points (47.0)}}{\text{Total Credit Hours (20)}} = 2.350$$

The Registrar's Office will not be able to recalculate or confirm the calculations of quality-point averages for individual students. Each student's record will be brought up to date before his graduation. In the meantime, borderline cases will be checked by the Lincoln College Academic Standing Committee.

Academic Progress Criteria

It is expected that the student will at all times endeavor to achieve a high record of achievement. The Academic Standing Committee reserves the right to review all students' records and deny readmission to those who fall below a minimum quality level of achievement. This requirement has been established as follows:

In order to be allowed to remain in the College, a student must have achieved a quality-point average of 1.4 at the completion of 24 quarter hours; 1.5 at the end of 48 quarter hours; and 1.6 at the end of 72 quarter hours.

It should be further noted that a student who accumulates the equivalent of six uncleared failures may be considered ineligible to continue his program of study.

Scholastic Probation

The Academic Standing Committee has the authority to dismiss from the College or place on scholastic probation any student whose scholarship is deficient for the following reasons: low quality-point average, excessive outstanding failures regardless of quality-point average.

A student on scholastic probation should be particularly diligent in his current courses and make every effort to clear his academic defi-

ciencies as soon as possible. Students whose academic record does not improve or whose failures are not properly cleared may not be allowed to register for further courses.

When a student on scholastic probation has cleared all or a substantial part of his outstanding failures he may petition the Academic Standing Committee for removal from the probation list.

Disciplinary Probation

The Academic Standing Committee has the authority to dismiss from the College or place on disciplinary probation any student whom it may deem unworthy because of conduct or character. The Committee may ask any student to withdraw from the College who is obviously out of sympathy with its aims and ideals.

GRADUATION REQUIREMENTS

To receive the degree of Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology, the student must fulfill the following requirements:

1. Must have been formally accepted into "degree candidate" status by the Committee on Admissions;
2. Complete all the courses of his particular curriculum, either by attendance at Lincoln College or by receiving Advanced Standing Credit;
3. Complete associate degree programs in eight years and bachelor's programs in twelve years from the date of entrance into Lincoln College. Extensions of time may be granted by the Academic Standing Committee;
4. Be in attendance for at least a year preceding the date on which he expects to graduate; and he must complete at least one-fourth of his work in Lincoln College;
5. Achieve a quality-point average of at least 1.75 in courses taken in the College to be awarded the Associate in Engineering or Associate in Science degrees, and 1.80 for the Bachelor of Engineering Technology degree;
6. Pay the Graduation Fee of $25.

In addition, students:

7. May not earn two associate degrees or two bachelor's degrees in the same field of academic specialization;

8. Must complete a minimum of thirty quarter hours of additional credits to be awarded more than one associate or bachelor's degree;
9. May not be awarded the associate and bachelor's degree at the same commencement;
10. Must petition for transfer of credits completed at other institutions prior to January 1 of the year in which the degree is to be awarded.

ACADEMIC AND PROFESSIONAL AWARDS

The academic programs offered by Lincoln College and the teaching, counseling, and professional efforts of the faculty and staff are aimed at motivating the student toward the highest possible levels of academic achievement. To encourage scholarly and professional excellence and to recognize quality achievements, the following awards are made at appropriate times during the academic year:

Honor List and Dean's List Scholars

Students maintaining honor grade averages—minimum quality average of 3.000 and no "D" grades—during a quarter while carrying a minimum of six quarter hours credit are recognized as Dean's List Scholars. Students desiring certificates attesting to this honor should request them from the Lincoln College Office.

Scholastic Achievement Certificates

Upon graduation with an associate degree, Scholastic Achievement Certificates will be awarded to those students who have achieved distinctly superior attainment in the academic work as follows:

Scholastic Achievement	3.000-3.499 Q.P.A.
High Scholastic Achievement	3.500-3.749 Q.P.A.
Highest Scholastic Achievement	3.750-4.000 Q.P.A.

In order to be eligible for a Scholastic Achievement Certificate the student must earn a minimum of forty-eight quarter hours of credit in Lincoln College.

Graduation with Honor

Upon graduation, honors will be conferred upon students who have achieved distinctly superior academic achievement in a program leading to the Baccalaureate Degree as follows:

Honor	3.003-3.499 Q.P.A.
High Honor	3.500-3.749 Q.P.A.
Highest Honor	3.750-4.000 Q.P.A.

In order to be eligible for Honors the student must earn a minimum of seventy-two quarter hours credit in Lincoln College and receive a vote of approval from the faculty with responsibility for his program.

University Awards

The University Awards are presented annually to seniors pursuing associate degree programs, who have achieved high ranking cumulative academic records. The tuition scholarship awards are accompanied by an appropriate certificate.

Lincoln College Faculty Scholarship Award

The faculty encourages the achievement of scholarship by making monetary awards.

The Faculty Scholarship Fund was established in 1969 by voluntary contributions of the Lincoln College Faculty.

The Scholarship Committee determines the number and size of awards based on available funds.

The basis of the award is determined by need, academic achievement, and personal qualifications. The Scholarship Committee invites applications by announcing the specific requirements of eligibility during the school year.

Technology Awards

The Technology Awards are presented annually to seniors pursuing associate degree programs, who have demonstrated superior academic and professional capabilities in their special career fields. The scholarship awards and appropriate certificates are distributed to outstanding students enrolled in the following program categories:

Civil Engineering Technology
Commercial Aviation Technology
Computer Engineering Technology
Electrical Engineering Technology
Mechanical Engineering Technology
Science Technology
Fire Technology

Class Marshal Award

The Class Marshal Award is presented annually at the Class Day Banquet for Graduates, to the top ranking senior in a baccalaureate program. The award consists of an appropriate certificate, a selection of books, and the President's Letter of Commendation.

Sigma Epsilon Rho Awards

Sigma Epsilon Rho, the evening colleges' scholastic honor fraternity, annually awards plaques and scholarships for outstanding scholastic achievement to the highest ranking students in University and Lincoln Colleges at the end of their junior year.

Sigma Epsilon Rho Honor Society Scholarship Award

The Sigma Epsilon Rho Honor Society Scholarship Award, established in 1974 by the membership of the Society, is awarded annually to a student of University and/or Lincoln College. Eligible students must have a cumulative Quality Point Average of 3.0 or better after completing 80 percent or more of their required studies.

Alumni Award for Professional Promise

Established in 1947 by the Northeastern University Alumni Association, the Alumni Award for Professional Promise is presented annually at a final senior class meeting in the spring of the year. The award is made to the senior who has demonstrated unusual professional promise through character traits, scholastic achievement, and work performance.

E. W. Wiggins Aviation Awards

The E. W. Wiggins Aviation Awards provide scholarship aid to students enrolled in the Commercial Aviation Technology Program, who, in the judgement of the Northeastern University-Wiggins Airways Advisory Committee, have demonstrated the highest degree of proficiency in flying and related courses during the academic year.

Leslie B. Cutler Aviation Awards

The Leslie B. Cutler Aviation Awards were established by the members of the Aero Club of New England to honor and give recognition to the late Senator Cutler's service and devotion to the interests of aviation in the Massachusetts General Court, national legislative bodies, and her private life. These scholarship awards are made to students in the Commercial Aviation Technology Program who most typify the same interest, devotion, and leadership demonstrated by Senator Cutler during her long and distinguished public career.

financial information

TUITION

Initial Registration Fee

A nonrefundable $10.00 registration fee, required of all new students, is due and payable upon registration.

Tuition

Tuition for all part-time evening courses is $35.00 per quarter hour of credit. Tuition for Day BET students will be based on the current day school rate. Charges for registration and tuition for special courses are at the rate specified for each course. Students are permitted to audit courses; however, there is no reduction in fees for auditing.

Students are not permitted to attend class sessions or take any examination or test until they have paid their tuition fees or have made satisfactory arrangements for payment.

Students will not be advanced in class standing, nor permitted to re-enroll in the University, nor have degrees conferred, until all financial obligations to the University have been met.

No certificate of honorable dismissal will be issued to any student who has not fully met his financial obligations to the University.

Non-credit courses are charged at quarter-hour rates equal to those of credit courses meeting on an equivalent contact-hour schedule.

Aviation Technology Tuition (Day Program)

FIRST YEAR	(All Students)	
Quarter 1	Quarter 2	Quarter 3
$1211	$1068	$969
Summer	(Flight Option)	
Quarter 4	Commercial Flight I, II, III, IV	
$2000		
SECOND YEAR	(Flight Option)	
Quarter 5	Quarter 6	Quarter 7
$986	$1061	$1061

SECOND YEAR	(Non-Flight Option)	
Quarter 5	Quarter 6	Quarter 7
$560	$560	$560

Tuition Deposit

Applicants accepted for admission to the day program must upon request pay a nonreturnable tuition deposit of $100 as evidence of their intention to enroll; this will be applied to their first tuition payment.

Additional Flight Courses

Certified Flight Instructor	$ 537	$ 568
Instrument Flight	$ 645	$ 645
Helicopter Flight	$1352	$1352

(These rates cannot be guaranteed from academic year to academic year.)

Additional Time: Students requiring additional time beyond the prescribed course limits shall be charged for such time at the regular Wiggins-Northeastern rates.

Flight Tests: Flight tests are not included in the regular course curriculum. Charges will be made for the Commercial Flight Test and the Instrument Flight Test on the basis of 1½ hours of aircraft and 1½ hours of ground time at the regular Wiggins-Northeastern rate. The Instructor Flight Test which must be given by a regular FAA Examiner requires 1½ hours of aircraft time only.

Tuition for all courses is charged on a quarter basis and is payable in full at the beginning of each quarter. As a convenience without additional charge, and at the student's request, the Bursar's Office will allow payment in two installments.

Deferred-Payment Privilege

Occasionally situations develop, usually beyond the control of the student, which make it difficult to meet payments in the regular manner. Under such circumstances the student is advised to discuss his problem personally with the Bursar's Office where a convenient deferred-payment agreement can be worked out. A service fee of $2.00 is charged for this privilege.

Late Payment Fee

Payments of tuition are due by Saturday of the week in which the bill is dated. If payment, or a deferred-payment agreement is not arranged by that date, a late fee of $10.00 is charged by the Bursar.

Refund of Tuition

The general policy in all schools and colleges of the University with respect to refunds of tuition to students is as follows:

The University provides all instruction on an academic quarter basis for which students pay at the beginning of each quarter. Tuition refunds will be granted through the first four weeks of a quarter only when specified conditions are met. Questions regarding refunds should be discussed with the Bursar.

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal application when filed with the Registrar in Room 120 Hayden Hall. Non-attendance does not constitute official withdrawal.

Refunds will be granted in accordance with the following schedule:

Official withdrawal filed within:	Percentage of tuition
1st week of quarter	100%
2nd week of quarter	75%
3rd week of quarter	50%
4th week of quarter	25%

Tuition Underwritten by Employers

An increasing number of companies are underwriting part or all of the cost of tuition of students in their employ. In cases in which payment is made directly by the employer to the University, the student should furnish the Bursar's Office a purchase order covering his registration or a statement from an officer of his company certifying that the company is underwriting the tuition.

Student Bursar

All inquiries about student accounts should be directed to the Student Account Bursar, 437-2270.

Veterans' Benefits

Veterans' benefits depend on course load and increase sharply when a student's program exceeds eight quarter hours per quarter. Questions and applications should be directed to Room 245 Richards Hall.

SPECIAL FEES

Student Center Fee

Students attending the Huntington Avenue Campus, Boston, in the evening in a part-time program of study will be assessed a Student Center Fee of 75¢ per quarter.

Health Service Fee

Students attending the Boston, full-time Day Co-op B.E.T. programs are required to pay a Health Service Fee of $90.00. The program is available to Aviation Technology Students on an optional basis.

Missed Final Examination Fee

Students absent from the regularly scheduled final examination at the end of a course may petition for a "special final examination." The fee for each examination requested by the student is $5.00. The fee must be paid when the petition is filed in the University Registrar's Office.

Proficiency Examination Fee

Applicants for admission may petition to be awarded advanced standing on the basis of achievement demonstrated by a "proficiency examination." The fee for each examination requested by the applicant is $10.00. The fee must be paid when the petition is filed in the Lincoln College Office.

Graduation Fee

The University graduation fee, charged to candidates for the associate or bachelor's degree, is $25.00 payable on or before May 1 of the year in which the student expects to graduate.

Transcript of Record Fee

Students may request transcripts of their records at the University Registrar's Office. There is no charge for the first transcript. After the initial transcript there is a charge of $1.00 per copy, payable in advance. If more than one transcript is requested at one time the charge is $1.00 for the first copy and 50¢ for each additional copy.

TEXTBOOKS AND SUPPLIES

Students purchase their own textbooks and work materials. The cost varies according to the subject for which the student is enrolled. The average cost for a normal program of four subjects generally ranges from $25.00 to $50.00. Textbooks for single courses range from $4.00 to $15.00.

Students enrolled in Engineering Graphics should be prepared to spend $10.00 to $15.00 for drawing supplies and $10.00 to $20.00 for a set of drawing instruments in addition to the textbooks.

LOAN PROGRAMS

Full-time students in Lincoln College who are pursuing the B.E.T. Program should refer to the Undergraduate Catalog *for financial aid information.*

National Direct Student Loan

This program is available to students who are carrying at least one-half the normal academic workload, are accepted as degree candidates, and who show evidence of financial need.

The Federal maximum a graduate student may borrow is $5,000 while pursuing the post-baccalaureate degree.

Repayment and interest on these loans do not begin until nine months after the student ceases to carry at least a half-time academic load at an institution of higher education. The repayment of principal may be extended over a ten-year period with the interest at the rate of three percent per annum. Repayment may be deferred up to a total of three years while a borrower is serving as a Peace Corps or VISTA volunteer.

Community Sources

Students and their families are urged to explore community, industrial, and foundation sources for collegiate financial aid. Parental employers or the appropriate union organization may be a source. In addition, local, civic, political, religious or educational leaders are often aware of aid sources in the immediate community. Some typical sources may include: P.T.A., Kiwanis, Lions, Elks, Knights of Columbus, Masons, Sons of Italy, Rotary, State Rehabilitation, American Legion, etc.

University Grants

Each year Northeastern University grants a substantial number of full and partial tuition grants to students who have demonstrated both above-average scholastic achievement and financial need. All applications for aid are automatically considered for all grants administered by the University. It is not necessary for an applicant to specify the grant in which he is interested.

Veterans' Benefits

Any veteran covered by the Veterans Readjustment Act of 1966, Public Law 89-358, should report to Room 245 Richards Hall to fill out the proper enrollment forms. These forms will be made available during registration periods for all students in the Law Enforcement Programs at special off-campus locations.

Students needing additional information as to eligibility, allowances, or other details are urged to contact their local office of the Veterans Administration as early as possible.

Guaranteed Student Loan Program

Under this program, students who are matriculated degree candidates, enrolled for at least one-half the normal academic work load, may borrow from a participating bank or other financial institution. Terms and conditions vary from state to state, but a student generally may borrow up to $1,500 a year (the law allows a maximum of $2,500 per year) depending on financial need. The Federal Government pays the interest while the student is in school if the student is eligible for interest subsidy.

The student must have submitted, through the College Scholarship Service, a Parents' Confidential Statement or, if he has been declared financially independent by the Financial Aid Office, a Students' Confidential Statement. These forms are available in the Financial Aid Office.

Applications for the loan itself are available from local banks or the Education Office of your State government. Additional information and necessary application forms for Massachusetts residents are available from the Financial Aid Office.

Martin Luther King, Jr. Scholarship Fund

Established in 1969 in memory of the late Rev. Martin Luther King, Jr. Awards are made as openings occur, to adults from minority groups who would otherwise be unable to continue their education. Stipends will cover tuition expenses not to exceed six quarter hours in any academic quarter. (excluding Summer Quarter).

H. Patricia Taylor Scholarship Fund

The H. Patricia Taylor Scholarship Fund was established in 1974 by H. Patricia Taylor, a graduate of University College, and her husband, Harry C. Taylor, a graduate of the School of Business. The Scholarship expresses their appreciation for financial assistance made available to Mrs. Taylor while obtaining her degree, and is an attempt to provide similar funds to assist others in realizing their potential through higher education. The income from the Scholarship Fund will be awarded annually to a student enrolled in University College or Lincoln College who demonstrates financial need and academic stability and who meets certain other conditions of eligibility.

The University does not award financial assistance in any form to non-citizens of the United States.

student activities and alumni information

Evening Student Council

The Evening Student Council was formed to provide a representative body to promote the welfare of the student body in non-academic areas and to foster extracurricular activities which will enrich University life. It affords participants opportunities to meet and develop close personal relationships with fellow students and administrative staff.

The Evening Student Council provides students with opportunities to develop leadership skills and gives them a chance to discuss matters of professional interest with experts in their chosen field.

The Council is made up of interested students in University and Lincoln College, representatives of part-time interest groups, and those specially certified by the Council because of their demonstrated interest in the overall adult programs of the University.

The E.S.C., a member of the International Association of Evening Student Councils, meets on the first Monday of each month at 8:30 p.m. Students are welcome to visit, observe, and express opinions concerning evening student life.

Social and Professional Clubs

Student activities for part-time students are planned, organized, and operated by the student body with the assistance of the Director of University-Lincoln College Student Activities. The programs are designed to keep pace with the changing needs of adult students and to provide maximum opportunity for student participation. All part-time students in University College and Lincoln College are welcome to participate.

The program is flexible in nature and pioneering in spirit to meet the needs of adult students. The Office of University-Lincoln College Student Activities is particularly interested in developing new clubs which will benefit students professionally and educationally. If students wish to start clubs related to their professions, this office will help them plan and organize on the local and national level. The program is dedicated

to assisting the adult student in the development of his fullest potential. The University-Lincoln College Student Activities Office is located in 102 Churchill Hall.

Evening Ski Club

The Evening Ski Club was established as a special interest club by students in University and Lincoln College to give skiers an opportunity to meet other skiers for the purpose of promoting the sport and its related activities. Events sponsored by the Evening Ski Club include wine and cheese parties held locally and in the various ski areas of Maine, New Hampshire, and Vermont. A summer clambake is also arranged on a local beach, usually in July or August. Meetings are held from October through April on a bi-weekly basis on the main campus. Students interested should contact the Evening Student Activities Office in 102 Churchill Hall.

Use of Gymnasium Facilities

Specific schedules for use of the pool, weight training room, indoor athletic field and track, handball courts, gymnasium, and wrestling room are set up each quarter for use by all part-time students. In order to become eligible, students must obtain a temporary Gymnasium Pass each time they wish to use the Cabot Gymnasium Complex. Passes are available in the Cabot Complex, Monday through Friday from 4:30 p.m. to 9:00 p.m. and on Saturday and Sunday from 1:00 p.m. to 4:00 p.m. All students requesting a pass must present their Student Identification Card, and passes will be issued only on a first-come, first-served basis. Students using the Cabot Gymnasium Complex are required to abide by all the rules of the gym and may be asked to complete a Medical Release Form.

Society for the Advancement of Management

The Society for the Advancement of Management is the recognized national professional organization of managers in industry, commerce, government, and education. It has been dedicated to the advancement of management and managers since 1912, when the original Taylor Society was established. University chapters operate in 190 leading colleges and universities in the United States, Canada, Puerto Rico, and Hawaii.

The Northeastern University chapter is open to all adult students interested in furthering their growth and insight into the practice of the management professional. Meetings, conferences, and seminars are held.

Pi Tau Kappa Fraternity

Pi Tau Kappa is a social fraternity open to all evening students. It is organized to enhance their social welfare and promote closer affiliation with the University.

Kappa Tau Phi Sorority

Kappa Tau Phi Sorority is a social organization open to all evening women students. Its purpose is to promote fellowship among the women students and to form a closer tie with the University. Monthly dinner meetings are held. Two scholarships are awarded annually to scholastically superior women students.

Alpha Eta Rho

International Aviation Fraternity

The Nu Epsilon Chapter is a social organization open to all Aviation Technology Students. It is organized to actively associate the interested students of aviation with leaders and executives in the industry. This close association, strengthened through the bonds of an international aviation fraternity, establishes opportunities for every member in his relation to aviation and inspires interest and cooperation among those in the profession who are also members of Alpha Eta Rho.

Lamplighter Column

News articles written by interested students in University and Lincoln College may be submitted to the *Northeastern Today* newspaper to be printed under a Lamplighter heading. All news articles should be sent to the Evening Student Activities Office, 102 Churchill Hall at least two weeks prior to publication. Due to space considerations in *Northeastern Today,* some articles may require editing by its professional staff.

Alumni Association

More than 52,000 alumni are members of the all-University Alumni Association, which has as its prime purposes the promotion of the welfare of Northeastern University, the establishment of a mutually beneficial relationship between the University and its alumni, and the perpetuation of fellowship among members of the Association.

The Association headquarters is located in Room 101 Ell. The official records and addresses of alumni are maintained in Room 260, United Realty Building.

Activities of the Association, including the Homecoming Day celebration and the annual presentation of Professional Promise Awards to

outstanding seniors in each of the Colleges, are directed by the Vice President for Alumni Affairs. Alumni officers also attend meetings of undergraduate classes to form a closer relationship between the Association and its future members.

The Alumni Relations Office assists the various class officers in planning class reunions. Each class normally holds a reunion every five years during the month of June. The Vice President for the Alumni Class Council is responsible for coordinating class activities and organizing class functions.

The Vice President for Alumni Clubs works in close association with officers of the more than fifty Regional Alumni Clubs which have been established from coast to coast. All alumni are eligible to become members of these organizations. The alumni clubs meet periodically, often in conjunction with visits from members of the faculty or with athletic events.

For Boston area alumni, monthly luncheon meetings are held in both the downtown and uptown sections of the city.

The Association also sponsors and assists the alumnae organization and the Varsity Club, both of which have their own officers and conduct various programs throughout the year. Through the Varsity Club, the Association presents trophies to the outstanding athlete of the year in each of the six major sports.

The Northeastern University Alumni Association is a member of the American Alumni Council, a professional organization composed of representatives of all major colleges and universities in the United States and Canada.

Alumni Relations

The Alumni Association is providing a uniquely valuable service to both the University and the community by sponsoring admissions conferences for parents of high school students who are interested in attending college. These meetings, held in cooperation with the Northeastern Department of Admissions, have been extremely well attended. Local residents as well as alumni of the University have been invited to these conferences, which help to clarify many of the questions today's parents and young people have concerning application procedures of colleges and universities.

Placement Service

Many requests from employers are received by the College, for men and women of potential ability to fill important positions of responsibility. It is the policy of the College to serve the students whenever

possible by placing them in those positions which promise attractive opportunities for development and advancement. The College, however, cannot guarantee to place its students, but it does endeavor to keep in close touch with those who desire placement service and to assist them in obtaining satisfactory advancements in positions and income. No charge is made for placement service. Those needing this assistance should arrange an appointment with the Director of Placement.

While the College cannot guarantee positions to its graduates, the number of requests usually exceeds the number available in the graduating class of any given year. The policy of the College is to find the best qualified men and women among its graduates for the positions which the College is called upon to fill.

The College, in recommending a graduate for a position, furnishes the prospective employer with the facts as to the graduate's ability, character, attitudes, habits, and other qualifications for the position as revealed by the College records. In the last analysis, however, placement in a position depends largely upon the graduate's ability to sell his services to the prospective employer. Most employers prefer to consider two or more candidates for a position and generally request the College to suggest more than one person. Many manufacturing and commercial firms throughout New England call upon the College to assist them in filling important executive and managerial positions.

academic programs of instruction

SCOPE OF PROGRAMMING

Lincoln College and Lincoln College in collaboration with University College, and Wiggins Airways, Inc., conduct educational programs at the undergraduate level in the following areas of technology:

Pre-Technology Preparation
Aviation Technology
Science Technology
Civil Engineering Technology
Electrical Engineering Technology
Mechanical Engineering Technology
Computer Engineering Technology
Environmental Control Technology
Fire Technology

Program Selection

Students should determine that the program they desire is offered in a suitable time period. Most programs are offered in the evening on a part-time basis. However, Aviation Technology is offered on a full-time day basis.

In the fields of Electrical Engineering Technology and Mechanical Engineering Technology, full-time day cooperative programs were established in the fall of 1971. Students may enter as freshmen or transfer with advanced standing by applying to the Office of Admissions, Northeastern University, 150 Richards Hall.

Degrees and Certificates

Lincoln College conducts education programs on the undergraduate level in various technological areas leading to the following degrees and certificates:

1. Associate in Science degree (A.S.) requiring 96 to 99 quarter hours of credit;

2. Associate in Engineering degree (A.E.) requiring 96 quarter hours of credit;
3. Bachelor of Engineering Technology degree (B.E.T.) requiring 180 quarter hours of credit;
4. Certificates may be earned in specified programs with a minimum of 30 quarter hours of credit;
5. Most courses are available for special students.

Opportunities for Associate Degree Graduates

Graduates of the Engineering or Science Technology Programs in Lincoln College, or other similar colleges and institutions, who have earned the Associate in Engineering or the Associate in Science degrees, may transfer applicable credits toward the degree requirements in the baccalaureate programs in Engineering Technology, Medical Technology, or Industrial Technology.

Those who have maintained a quality-point average of 2.500 or higher in the Associate degree programs may apply for transfer to either of the following College of Engineering curricula: (1) day-college Cooperative Education programs in Civil, Mechanical, Electrical, or Industrial Engineering with credit for up to two years of the five-year program; or (2) the part-time evening programs in Civil, Electrical, or Mechanical Engineering with credit for the first three years of the eight-year programs. Fractional credit may be awarded to students with a quality-point average slightly lower than 2.500.

PRE-TECHNOLOGY PREPARATION

(Non-Credit)

Beginning students who have been away from formal study for some time are frequently concerned about their study habits and their verbal, mathematical, and scientific backgrounds. Applicants who anticipate some problems should give serious consideration to enrolling in the non-credit introductory courses, the Reading Improvement Program, or doing review work through programmed instruction at the Learning Center.

Introductory Courses

These courses are designed to develop background for basic courses in the degree programs and thus increase the probability of successful achievement in advanced technology courses.

Introductory Mathematics I and II

A two-quarter review of high school algebra and some plane geometry designed to prepare students for the credit course 10.307 College Algebra and Trigonometry I. These courses are required of students who do not demonstrate sufficient algebra proficiency on the Mathematics Placement Test. (See course description for 10. 301 and 10.302, page 135.)

Introductory Physics I and II

A two-quarter relatively non-mathematical introduction to the concepts of physics designed to prepare students for the credit courses 11.317 Physics I or 11.304 General Physics I. (See course description for 11.301 and 11.302, page 138.)

Basic Mathematics I and II

A two-quarter review of basic algebra designed to prepare students for the credit course 10.327 Mathematics I. These courses are required of students who do not demonstrate sufficient proficiency in algebra on the Mathematics Placement Test. (See course descriptions for 10.330 and 10.331, page 136.)

English for International Students I, II, III

A three quarter, non-credit sequence for foreign-speaking students covering introduction to English grammar with emphasis on listening, speaking, and writing; selected readings and exercises to strengthen vocabulary and pronunciation; preparation of written and oral reports, business and social correspondence; and advanced work in written and spoken English preparatory to entering 30.601 Composition and Rhetoric I.

GENERAL INTEREST COURSES

The following courses of general interest are offered for students who desire to inquire into the technical fields but may not have the mathematical background to pursue the prôfessional courses. In general, these courses may not be substituted for similar courses in the several technical curricula.

1. Technology of Modern Architecture I, II
2. Man and Materials
3. Electric Devices and Systems I
4. Electric Devices and Systems II

5. Interpretation of Industrial Drawings
6. Foundations of Mathematics I
7. Foundations of Mathematics II
8. Foundations of Mathematics III
9. Man's Physical Environment I
10. Man's Physical Environment II

Reading Improvement

The ability to read well is one of the most important basic tools for the successful completion of a college program. The University's Center for Reading Improvement gives the student an opportunity to develop good reading habits in preparation for the intensive reading assignments of college-level courses. The following core skills are covered: previewing, locating main ideas and related details, using guide words and phrases, identifying structural patterns, outlining and summarizing, note-taking, vocabulary building, skimming and scanning, speed-reading, and critical reading. Further information may be obtained at the Center for Reading Improvement.

Programmed Study

Students may enroll in non-credit, self-study courses to better prepare themselves for college academic work and strengthen their high school background at the University's Learning Center.

Courses which may be useful to students in the Lincoln College programs in technology are: slide rule, trigonometry, effective listening, spelling, algebra, study skills, calculus, and English.

University Learning Center hours:
Monday, Tuesday—8:00 a.m.–8:00 p.m.
Wednesday, Thursday, Friday—8:00 am.–5:00 p.m.
Thursday—closed 11:45 a.m.–12:50 p.m.

AVIATION TECHNOLOGY PROGRAM

The Aviation Technology program offered by Lincoln College in cooperation with Wiggins Airways is designed to provide the scientific, technological, and business backgrounds required by the modern commercial pilot or entrepreneur in today's aviation and aerospace world as it operates within the framework of the total ship-rail-motor-aircraft transportation industry.

The tremendous expansion of aviation as an increasingly important sector of the nation's industrial economy has accelerated the demand for appropriately trained and educated personnel for careers related

to the flight, instructional, regulatory, management, and technical aspects of the aviation industry.

Flight opportunities range from pilot or co-pilot in the single- or multi-engine air-taxi and cargo services of the local, fixed-base feeder airlines or private company, to flight engineer, first officer, or captain in the high-speed, multi-jet-engined services of the national and international systems of the major airlines.

The education-training-regulation sector of the aviation industry provides additional career opportunities as flight, ground, or simulator instructors or as flight examiners, training or safety directors, and supervisors in the licensing and regulatory agencies of local, state, or federal government.

Persons knowledgeable in the technology and regulation of aviation, who are also skillful in dealing with people, may pursue challenging and rewarding careers in aviation sales, airport operations, aviation business management, etc.

The Aviation Technology related program presently offered by Lincoln College is a two year full-time day program which leads to an Associate in Science degree.

Wiggins Airways

Wiggins Airways has been in operation since 1929. Their facilities located at Norwood Airport, fifteen miles from the main Northeastern University campus, provide the flight training courses for the Aviation Technology programs offered by Lincoln College. They offer air taxi, rental, maintenance, repair, aircraft service parts, electronics, and helicopter services. Wiggins is the New England distributor for Piper Aircraft.

The airport facilities comprise two 4,000′ runways, one with high intensity lights; a Federal Aviation Administration control tower in operation from 8:00 a.m. to 8:00 p.m. every day of the year; "H" facility (navigational aid for radio location); two Unicom frequencies for radio communication; and weather teletype service. Modern, air-conditioned classroom facilities, with visual aids, library, and other study aids are available for academic and ground-related courses.

The aircraft fleet consists of eighteen Piper Cherokee 140's; two Piper Cherokee 180's; one Piper Cherokee 6; plus the following: Piper Twin Engine Aircraft—Comanche, Aztec and Navajos, two Flightmatic Simulators, and a General Aviation Training Simulator. All aircraft are maintained on the premises in a federally certified aircraft repair station which is also Piper factory certified.

Aviation Technology

Leading to the Degree of Associate in Science
(Day Program—2 years)

The Curriculum of the Aviation Technology program is designed to provide in the shortest reasonable time, the required amount of related academic instruction and accumulated flight time to thoroughly prepare the student for certification with the Private and Commercial Ratings by the Federal Aviation Administration. In the two-year program, the student will acquire the scientific, technological, and business background for employment in a variety of positions including: Flight Crew Officers, Airport Management, Fixed Base Operations, Air Transportation, Aviation Sales, F.A.A. positions, etc.

Prerequisites: Satisfactory completion of the Mathematics Placement Test or Introductory Mathematics I and II (10.301 and 10.302), medical certificate—F.A.A. Class I or II, interview with Director of Flight Instruction and Aviation Program Counselor.

First Year

		Total Yearly Q.H.
10.307, 10.308	Algebra & Trigonometry I, II	8
96.391, 96.392	Air Science A & B	6
30.603	Comp. & Rhet. (Int.)	4
93.401	Technical Communications	4
11.317, 11.318, 11.319	Physics I, II, III	12
48.514	Elements of Transportation & Distribution	2
96.399	Flight Physiology	2
96.395	Meteorology & Climatology A	3
48.593	Air Transportation A	3
96.331, 96.332, 96.333	Primary Flight I, II, III	4½

Summer Term (Flight Option)

96.341, 96.342	Commercial Flight I, II	3

Second Year (Flight Option)

96.324, 96.325	Introductory Avionics; Avionics	8
96.393, 96.394	Advanced Air Science A, B	6
96.308	Aircraft Power & Systems	4
96.425	Chronology of Aviation	2
96.396	Meteorology & Climatology B	3
48.594	Air Transportation B	3
96.345	Commercial Flight V	1½
96.361, 96.362	Instrument Flight I, II	3
96.376, 96.377	General Aviation Operations A, B	6
41.551, 41.552	Accounting A, B	6
	Total	97

Second Year (Non-Flight Options)

Students electing the Non-flight Option will replace the commercial flight courses with a sequence of air transportation, law enforcement, engineering, or airport management courses. These courses are listed under the description of courses at the end of the catalogue.

Students having definite plans to enter other upper class programs following the completion of the Associate degree should consult their adviser regarding entrance requirements prior to registering for second-year courses.

Avionics Technology (second-year option)

The electronics equipment used in today's aircraft is becoming increasingly sophisticated and complex. This increases the need for highly trained avionics technicians to maintain this equipment. The avionics curriculum provides the special knowledge and skills demanded in this area. Graduates from this program are eligible to write the Federal Communications Commission examination for the 2nd Class Radio License.

96.324, 96.325		Introductory Avionics; Avionics	8
96.393, 96.394		Advanced Air Science A, B	6
96.308		Aircraft Power & Systems	4
	96.425	Chronology of Aviation	2
96.396		Meteorology & Climatology B	3
48.594*		Air Trans B	2
	96.360	Aircraft Analysis	2
96.376*		General Aviation Operation A	3
09.307, 09.308, 09.309		Electrical & Electronic Graphics I, II, III	6
96.326, 96.327, 96.328		Avionics Laboratory I, II, III	6
96.329, 96.330		Radio Communications I, II	4
03.387, 03.388		Integrated Circuits I, II	4
			Total 50

*Optional

CIVIL ENGINEERING TECHNOLOGY PROGRAMS

Civil Engineering deals with the planning and construction of all kinds of relatively permanent structures and public works. Its major functions are: the preparation of surveys (topographical, geological, traffic, utility, etc.); the design of structures (buildings, bridges, dams, harbor facilities, etc.); the planning of municipal systems (water, sanitary, gas, flood control, air pollution control, etc.); and the development of transportation facilities (highway, railway, waterway, airway, etc.).

In performing these functions, the civil engineer will work in close association with professionals in the field, and he may develop technologically to function independently and in positions of managerial responsibility.

Employment opportunities for Civil Engineering Technology Program graduates are with town, city, state, or federal public works departments and agencies; private consulting, engineering, architectural, and construction organizations; and with railroads and the military.

The Civil Engineering Technology program and related programs offered by Lincoln College are:

Associate in Engineering Degree

Architectural Engineering Technology ..... page 75
Environmental Engineering Technology ..... page 76
Structural Engineering Technology ..... page 77
Surveying and Highway Engineering Technology ..... page 78

Bachelor of Engineering Technology Degree

Civil Engineering Technology ..... pages 79-80
Mechanical-Structural Engineering Technology ..... pages 105-106
Environmental Control Technology ..... pages 103-104

Architectural Engineering Technology

Leading to the Degree of Associate in Engineering

The program in Architectural Engineering Technology prepares the graduate to assume responsibilities in the planning, design, and construction of buildings. Employment opportunities are with architectural groups, consulting engineering firms, and government agencies.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Numbers	Course	Q.H.
10.307, 10.308	College Algebra & Trig. I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

01.301, 01.302, 01.303	Surveying I, II, III	6
02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
*09.311, 09.312, 09.313	Engineering Graphics I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6

Third Year

01.321, 01.322, 01.323	Introduction to Structures I, II, III	6
01.401, 01.402	Tech. of Modern Architecture I, II	4
01.390	Construction Administration	2
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Prog. I, II, III	6

Fourth Year

01.324, 01.325, 01.326	Structural Analysis I, II, III	6
01.331, 01.332, 01.333	Design of Structures I, II, III	6
01.393, 01.394, 01.395	Architectural Design I, II, III	6
01.371, 01.372, 01.373	Reinforced Concrete Design I, II, III	6
	Total A.E. degree	96

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

*27.541, 542, 543 Drawing I, II, III *(Prereq. none)*—a basic course in developing pencil, pen, and wash techniques; and the study of basic drawing problems using a variety of media —may be used to supplement this program.

Environmental Engineering Technology

Leading to the Degree of Associate in Engineering

The program in Environmental Engineering Technology prepares the graduate to assume responsibilities related to the design, construction, operation, and supervision of municipal plants and systems concerned with the storage and distribution of water and also the disposal of sewage and waste in urban areas with due consideration for contamination and pollution. Employment opportunities are with town, city, and state public works departments, private engineering consultants, architects, contractors, and many other engineering organizations.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

01.301, 01.302, 01.303	Surveying I, II, III	6
02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
09.311, 09.312, 09.313	Engineering Graphics I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6

Third Year

01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
12.544, 12.545, 12.546	†General Chemistry I, II, III	6

Fourth Year

01.324, 01.325, 01.326	Structural Analysis I, II, III	6
01.351, 01.352, 01.353	Environmental Engineering I, II, III	6
01.361, 01.362, 01.363	Materials and Soil Mechanics, I, II, III	6
01.371, 01.372, 01.373	Reinforced Concrete Design I, II, III	6
	Total A.E. degree	96

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

†Students may elect to add 12.547, 12.548, 12.549 Gen. Chem. Laboratory I, II, III (3 q.h.)

Structural Engineering Technology

Leading to the Degree of Associate in Engineering

The program in Structural Engineering Technology prepares the graduate to assume responsibilities related to the planning, design, and supervision of the construction of buildings, bridges, foundations; flood-control projects and all fixed structures. Employment opportunities are with consulting engineering firms, architectural groups, contractors, railroads, government agencies, the military, and other design-related companies.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

01.301, 01.302, 01.303	Surveying I, II, III	6
02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
09.311, 09.312, 09.313	Engineering Graphics I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6

Third Year

01.321, 01.322, 01.323	Introduction to Structures I, II, III	6
01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6

Fourth Year

01.324, 01.325, 01.326	Structural Analysis I, II, III	6
01.331, 01.332, 01.333	Design of Structures I, II, III	6
01.361, 01.362, 01.363	Materials and Soil Mechanics I, II, III	6
01.371, 01.372, 01.373	Reinforced Concrete Design I, II, III	6
	Total A.E. degree	96

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Surveying and Highway Engineering Technology

Leading to the Degree of Associate in Engineering

The program in Surveying and Highway Engineering Technology prepares the graduate to assume responsibilities related to the preparation and calculation of preliminary and legal surveys required for both small projects such as subdivision work, individual lot layouts, and highway layouts, as well as more complex projects relating to sewer systems, pipelines, power transmission lines, dams, reservoirs, and aqueducts. Employment opportunities are with independent surveying companies, civil engineering companies, highway, transit, and railroad planning groups, as well as cartographers, construction companies, and contractors.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

01.301, 01.302, 01.303	Surveying I, II, III	6
02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
09.311, 09.312, 09.313	Engineering Graphics I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6

Third Year

01.304, 01.305, 01.306	Advanced Surveying I, II, III	6
01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6

Fourth Year

01.307, 01.308, 01.309	Legal Aspects of Surveying I, II, III	6
01.311, 01.312, 01.313	Highway Engineering I, II, III	6
01.361, 01.362, 01.363	Materials and Soil Mechanics I, II, III	6
01.371, 01.372, 01.373	Reinforced Concrete Design I, II, III	6
	Total A.E. degree	96

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Civil Engineering Technology

(Accredited—Engineers' Council for Professional Development)

Leading to the Degree of Bachelor of Engineering Technology

The program in Civil Engineering Technology prepares the graduate to assume broad responsibilities related to surveys required to develop initial design criteria and specifications, and to become involved in the planning, design, and construction of all kinds of relatively permanent structures, municipal plants and systems, or transportation systems and facilities. Employment opportunities are in private consulting firms, construction companies, and public works agencies. Work involving surveying, design, and supervision is open to graduates.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

01.301, 01.302, 01.303	Surveying I, II, III	6
09.311, 09.312, 09.313	Engineering Graphics I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
30.601, 30.602	Composition and Rhetoric I, II	4
	English Elective	2

Third Year

01.304, 01.305, 01.306	Advanced Surveying I, II, III	6
02.301, 02.302, 02.303	Mechanics (Statics), I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
	*Laboratory	6

Fourth Year

01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
01.321, 01.322, 01.323	Introduction to Structures I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6

Fifth Year

01.324, 01.325, 01.326	Structural Analysis, I, II, III	6
12.544, 12.545, 12.546	†General Chemistry I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6
01.331, 01.332, 01.333	Design of Structures I, II, III	6

*Six quarter hours of laboratory work are required; see selection titled "Civil Engineering Laboratories."

†Students may elect to add 12.547, 12.548, 12.549 Gen. Chem. Laboratory I, II, III (3 q.h.)

Sixth Year

01.371, 01.372, 01.373	Reinforced Concrete Design I, II, III	6
01.361, 01.362, 01.363	Materials and Soil Mechanics I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
	*Elective I, II, III	6

Seventh Year

01.311, 01.312, 01.313	Highway Engineering I, II, III	6
	Elective I, II, III (Technical)	6
	*Elective I, II, III	6

Eighth Year

01.351, 01.352, 01.353	Environmental Engineering I, II, III	6
30.604, 30.605	Introduction to Literary Forms I, II	4
	English Elective	2
	*Elective I, II, III	6
	Total B.E.T. degree	180

Suggested Electives

		Q.H.
01.307, 01.308, 01.309	Legal Aspects of Surveying I, II, III	6
01.327, 01.328, 01.329	Advanced Structural Analysis I, II, III	6
01.334, 01.335, 01.336	Advanced Structural Design I, II, III	6
01.401, 01.402	Technology of Modern Architecture I, II	4
01.390	Construction Administration	2
18.511, 18.512, 18,513	Biology	12
18.521, 18.522, 18.523	Microbiology	12
**93.402, 93.403	Technical Communications I, II	4
Civil Engineering Laboratories		
01.310	Surveying Laboratory	2
01.364	Materials & Soil Mechanics Laboratory	2
01.380, 01.381, 01.382	Environmental Laboratory I, II, III	6

Elective courses for which proper preparation exists may be chosen from within or outside of the Civil Engineering discipline.

Transfer students may petition for elective credits for courses that are suitable to the curriculum.

Graduates of the Bachelor of Engineering Technology programs desiring to pursue programs leading to the Bachelor of Science in Engineering degree at Northeastern University may apply through the Admissions Office (150 RI). Programs in Electrical, Civil, and Mechanical Engineering are available on a part-time as well as a regular cooperative program. Industrial and Chemical Engineering programs are available only during the regular day programs.

Candidates must have at least 2.75 cumulative average and complete a course program prescribed by the major department and the Dean's Office.

*Before registering for any electives, the student should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his personal career objectives—for approval by the Academic Standing Committee.
10.324, 10.325, 10.326 Differential Equations I, II, III is recommended for all students planning advanced engineering technology subjects.

**93.402, 403 Technical Communications I, II may be used to fulfill English elective requirements.

ELECTRICAL ENGINEERING TECHNOLOGY PROGRAMS

Electrical Engineering deals with the design and operation of equipment and systems related to power, communications, data-processing, and electrical control. Its major functions are: 1) the generation, transmission and distribution of electrical energy for light and power purposes; 2) the development and production of equipment for telephone, radio, television, radar, and communication; 3) the design and construction of data-processing systems and analog or digital computers; and 4) the application of electrical and electronic devices in the control of processes and manufacture.

Employment opportunities for the Electrical Engineering Technology graduate are in public and private research laboratories, engineering consulting groups dealing with industrial and plant applications, design organizations dealing with operation and manufacture, sales engineering, and the electric utility industry.

The Electrical Engineering Technology program and related programs offered by Lincoln College are:

Associate in Engineering Degree

Bioelectric Engineering Technology ..... page 100
Electrical Power Engineering Technology ..... page 82
Computer Engineering Technology ..... page 101
Electronics Engineering Technology ..... page 83

Post-Associate Degree Certificate

Control Systems Engineering Technology ..... page 102

Bachelor of Engineering Technology Degree

Electrical Engineering Technology ..... pages 84-86
(Accredited by Engineers' Council for Professional Development)

The program in Electrical Engineering Technology leading to the Bachelor of Engineering Technology is also offered as a day cooperative program. A specimen curriculum is shown on pages 87-88. For further information please call (617) 437-2200, or write:

Dean of Admissions
Northeastern University
360 Huntington Avenue
Boston, Massachusetts 02115

Electrical Power Engineering Technology

Leading to the Degree of Associate in Engineering

The program in Electric Power Engineering Technology prepares the graduate to assume responsibilities related to the design, installation, operation, and maintenance of electrical machinery, power and control apparatus, and larger equipment employing heavy currents. The curriculum includes the study of the generation, transmission, and distribution of electrical energy for light and power, and the application and operation of electrical machinery in industry.

Employment opportunities are in public and investor-owned electrical utilities, electrical manufacturing companies, consulting engineering firms, control equipment design organizations, and communications companies.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II III	12

Second Year

03.301, 03.302, 03.303	Circuit Theory I, II, III	6
09.307, 09.308, 09.309	Electrical and Electronic Graphics I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6

Third Year

03.304, 03.305, 03.306	Circuit Theory IV, V, Electrical Measurements	6
03.346, 03.347, 03.348	Electronics for Industry I, II, III	6
03.331, 03.332, 03.333	Energy Conversion I, II, III	6
	Technical Elective I, II, III	6

Fourth Year

03.334, 03.335, 03.336	Control Circuits I, II, III	6
03.337, 03.338, 03.339	Basic Power Systems I, II, III	12
03.341, 03.342, 03.343	Power and Control Labs. I, II, III	6
	Total A.E. degree	96

Suggested Technical Electives

04.381, 04.382, 04.383	Nuclear Technology I, II, III	6
02.351, 02.352, 02.353	Thermodynamics I, II, III	6

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Electronics Engineering Technology

Leading to the Degree of Associate in Engineering

The program in Electronic Engineering Technology prepares the graduate to assume responsibilities related to the design, development, and operation of communications, data-processing, and electronic control equipment for applications in computers, military and space explorations, and in automated industrial production equipment. Employment opportunities are in communications equipment, electrical manufacturing, data-processing and control, equipment organizations, as well as other engineering-oriented companies.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

03.301, 03.302, 03.303	Circuit Theory I, II, III	6
09.307, 09.308, 09.309	Electrical and Electronic Graphics I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
11.321, 11.322, 11.323	Wave Phenomena, Semiconductor Physics, Semiconductor Devices	6

Third Year

03.304, 03.306, 03.323	Circuit Theory IV, Electrical Measurements, Electronic Lab.	6
03.311, 03.312, 03.313	Electronics I, II, III	12
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6

Fourth Year

03.314, 03.315, 03.316	Pulse and Digital Circuits I, II, III	6
*03.317, 03.318, 03.319	Principles of Communication Systems I, II, III	12
03.327, 03.328, 03.329	Advanced Electronic Labs. I, II, III	6
	Total A.E. degree	96

NOTE: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

*03.387, 03.338, 03.389 Active Integrated Circuits I ,II, III
plus
03.381, 03.382, 03.383 Transistor-Circuit Engineering I, II, III
may be substituted for 03.317, 03.318, 03.319 Principles of Communication Systems I, II, III.

Electrical Engineering Technology

(Accredited by Engineers' Council for Professional Development)

Leading to the Degree of Bachelor of Engineering Technology

The program in Electrical Engineering Technology prepares the graduate to assume broad responsibilities related to the design, development, operation, installation, and production of a wide variety of electrical and electronic equipment concerned with the generation and utilization of electric energy, communications, data-processing, and industrial control. Employment opportunities are in public and private research laboratories, engineering consulting firms dealing with industrial and plant applications, electric utilities, electrical and electronic organizations concerned with operation, manufacture, installation, and sales.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introduction Mathematics I and II courses (10:301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

03.301, 03.302, 03.303	Circuit Theory I, II, III	6
09.307, 09.308, 09.309	Electrical and Electronic Graphics I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
30.601, 30.602	*Composition and Rhetoric I, II	4
	English Elective	2

Third Year

03.304, 03.305**, 03.306	Circuit Theory IV, V, and Electrical Measurements	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.324, 10.325, 10.326	Differential Equations I, II, III	6
11.321, 11.322, 11.323	Wave Phenomena, Semiconductor Physics, Semiconductor Devices	6

Fourth Year

03.311, 03.312, 03.313	Electronics I, II, III	12
†03.324, 03.325, 03.323	Circuits Laboratory I, II and Electronic Lab.	6
03.331, 03.332, 03.333	Energy Conversion I, II, III	6

*30.603 Composition and Rhetoric (Intensive) may be substituted for 30.601, 30.602 Composition and Rhetoric I, II.

**Electronically oriented students may replace 03.305 Circuit Theory V with the technical course provided (see current schedule).

†03.324, 03.325 Circuits Laboratory is required for students having no previous degrees. Transfer students with an Associates degree should take 03.349 Advanced Electronics Lab. IV and 03.350 Advanced Electronics Lab. V.

Fifth Year

†03.317, 03.318, 03.319	Principles of Communication Systems I, II III	12
03.361, 03.362, 03.363	Transients in Linear Systems I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6

Sixth Year

†03.327, 03.328, 03.329	Advanced Electronic Labs. I, II, III	6
03.371, 03.372, 03.373	Analog, Digital and Hybrid Computers I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6
	*Elective I, II, III	6

Seventh Year

03.377, 03.378, 03.379	Control Systems I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
	*Elective I, II, III	6

Eighth Year

30.604, 30.605	Introduction to Literary Forms I, II	4
	English Elective	2
	*Elective I, II, III	6
	*Elective I, II, III	6
	Total B.E.T. degree	180

Suggested Technical Electives

		Q.H.
03.314, 03.315, 03.316	Pulse and Digital Circuits I, II, III	6
†03.337, 03.338, 03.339	Basic Power Systems I, II, III	12
†03.341, 03.342, 03.343	Power & Control Labs. I, II, III	6
03.364, 03.365, 03.366	Advanced Circuit Theory I, II, III	6
03.367, 03.368, 03.369	Advanced Pulse & Digital Circuits I, II, III	6
03.374, 03.375, 03.376	Digital Systems I, II, III	6
**03.381, 03.382, 03.383	Linear Active Circuit Design I, II, III	6
03.384, 03.385, 03.386	Microwave Semiconductor Devices and Circuits I, II, III	6
**03.387, 03.388, 03.389	Integrated Circuits I, II, III	6

Continued

*Before registering for any electives, the student should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his personal career objectives—for approval by the Committee on Education.

10.351, 10.352, 10353 Advanced Mathematics I, II, III is recommended for all students planning advanced engineering technology subjects.

**03.387, 03.388, 03.389 Integrated Circuits I, II, III
plus
03.381, 03.382, 03.383 Linear Active Circuit Design I, II, III
may be substituted for 03.317, 03.318, 03.319 Principles of Communication Systems I, II, III.

†03.337, 03.338, 03.339 Basic Power Systems I, II, III may be substituted for 03.317, 03.318, 03.319 Principles of Communication Systems.

03.341, 03.342, 03.343 Power & Control Labs I, II, III may be substituted for 03.327, 03.328, 03.329 Advanced Electronic Labs. I, II, III.

09.354, 09.355, 09.356	Computer Systems I, II, III	6
09.357, 09.358, 09.359	Computer Aided Design I, II, III	6
09.361, 09.362, 09.363	Computer Controlled Systems I, II, III	6
03.360	Introduction to Radar Systems	4
11.324	Introductory Survey of Lasers	2
93.402, 93.403	Technical Communications I, II (May be used for English elective)	4

Electrical Engineering Technology courses of elective nature may be chosen from the above list of courses.

Elective courses for which proper preparation exists may be chosen from within or outside of the electrical engineering discipline.

Graduates of the Bachelor of Engineering Technology program desiring to pursue programs leading to the Bachelor of Science in Engineering degree at Northeastern University may apply through the Admissions Office (150RI). Programs in Electrical, Civil, and Mechanical Engineering are available on a part-time as well as a regular cooperative program. Industrial and Chemical Engineering programs are available only during the regular day programs.

Candidates must have at least a 2.75 cumulative average and complete a course program prescribed by the major department and the Dean's Office.

Electrical Engineering Technology

(Day Cooperative Curriculum)

Leading to the degree of Bachelor of Engineering Technology

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12
30.113	Freshman Writing	4
30.114, 30.115	Introduction to Lit., Great Themes in Lit.	8
09.421, 09.422, 09.423	Principles of Computer Programming I, II, III	6
09.461, 09.462, 09.463	Engineering Design Graphics I, II, III	6
11.373, 11.374	Physics Lab. I, II	4

Second Year

10.421, 10.422	Calculus A, B	8
03.451, 03.452	Circuit Analysis I, II	8
11.420	Physics IV	4
03.440	Physical Electronics	4
03.324	Circuits Lab. I	2
(I) (II)	Liberal Arts Elective I, II	8

*Third Year

03.460	Engineering Analysis I	4
03.430	Energy Conversion	4
03.453, 03.454	Circuit Analysis III, IV	8
03.311, 03.312	Electronics I, II	8
39.115	Principles of Economics	4
03.410	Electrical Measurements	4
03.325, 03.323	Circuits Lab. II, Electronic Lab.	4

Fourth Year

03.470	Digital Computers	4
03.477	Control Engineering	4
03.313	Electronics III	4
03.327, 03.328	Advanced Electronic Lab. I, II	4
(I) (II)	**Technical Elective (A or B) I, II	8
(II)	Liberal Arts Elective II	4

*Note: Students desiring to terminate their program at the end of Quarter 7 may petition to be awarded the Associate in Engineering degree.

**Technical Elective A: Power Systems Sequence

Technical Elective B: Communication Engineering Sequence (see next page).

Fifth Year

Course Number		Course	Q.H.
03.478		Control Engineering II	4
	03.437	Distrb. Systems	4
03.329		Advanced Electronic Lab. III	2
	03.461	Engineering Analysis II	
		or	
	02.411	Mechanics A	4
(I)	(II)	Liberal Arts Electives I, II	8
(I)		**Technical Elective (A or B) III	4
	(II)	Technical Elective	4
		Total B.E.T. degree	180 Q.H.

TECHNICAL ELECTIVE SEQUENCES

Power Systems Sequence

03.337	Basic Power Systems I	4
03.338	Basic Power Systems II	4
03.339	Basic Power Systems III	4
	Technical Elective (selected from below)	4

Communication Engineering Sequence

03.317	Principles of Communication Systems I	4
03.318	Principles of Communication Systems II	4
03.319	Principles of Communication Systems III	4
	Technical Elective (selected from below)	4

Suggested Technical Electives

03.317	Principles of Communication Systems I	4
03.337	Basic Power Systems I	4
03.490	Optical Instrumentation	4
04.481	Nuclear Technology	4

Graduates of the Day Bachelor of Engineering Technology program who have maintained a superior level of achievement and who wish to continue their academic studies may be qualified to enter the part-time or full-time program leading to the Bachelor of Science in Engineering. For further information contact the Lincoln College Office at 219 Hayden Hall, telephone 437-2500.

MECHANICAL ENGINEERING TECHNOLOGY PROGRAMS

Mechanical Engineering deals with the harnessing of power resources by means of machinery to perform useful work. In contrast to civil engineering, which deals primarily with static forces and structures, mechanical engineering is more concerned with the motion and kinetics of devices which are activated by hydraulic, electrical, mechanical, or thermodynamic forces. Major functions of the mechanical engineer are: 1) design and installation of all kinds of machinery from pocket watches to the largest of steel boring mills; 2) development and production of engines and transportation equipment (automobile, aircraft, ship, railway, etc.); 3) construction and operation of furnaces, boilers, and heating and air-conditioning equipment for the control of atmospheric and environmental conditions.

Employment opportunities for Mechanical Engineering Technology graduates are in the areas of 1) research, design, or development; 2) production, operation, testing, or control; 3) installation, maintenance, and sales. In performing these functions, graduates will work in close association with professionals in the field and may develop technologically so as to function independently and in positions of managerial responsibility.

The Mechanical Engineering Technology program and related programs offered by Lincoln College are:

Associate in Engineering Degree

Mechanical Engineering Technology ..... page 90
Heat Engineering Technology ..... page 91

Bachelor of Engineering Technology Degree

Mechanical Engineering Technology (Accredited by Engineers' Council for Professional Development) ..... pages 92-93
Mechanical–Structural Engineering Technology ..... pages 105-106
(Accredited by Engineers' Council for Professional Development)

The program in Mechanical Engineering Technology leading to the Bachelor of Engineering Technology is also offered as a day cooperative program. A specimen curriculum is shown on pages 94 and 95. For further information please call (617) 437-2200, or write:

Dean of Admissions
Northeastern University
360 Huntington Avenue
Boston, Massachusetts 02115

Mechanical Engineering Technology

Leading to the Degree of Associate in Engineering

The program in Mechanical Engineering Technology prepares the graduate to assume responsibilities related to the design, production, and installation of mechanical tools, machinery, engines, and transportation equipment in which there is an intermingling of mechanical and hydraulic forces. Because of the increased mechanization of all industry, varied employment opportunities are available in private engineering consultant groups, in light and heavy industries, and in almost all engineering design organizations.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
09.311, 09.312, 09.313	Engineering Graphics I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6

Third Year

02.304, 02.305, 02.306	Mechanics (Dynamics) I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
*02.341, 02.342, 02.343	Materials I, II, III	6
09.314, 09.315, 09.316	Engineering Design I, II, III	6

Fourth Year

01.341, 01.342, 01.343	Fluid Mechanics I, II, II	6
02.324, 02.325, 02.326	Advanced Stress Analysis I, II, III	6
02.327, 02.328, 02.329	Mechanical Design I, II, III	6
02.331, 02.332, 02.333	Mechnical Technology Lab. I, II, III	6
	Total A.E. degree	96

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

*03.320, 03.321 Electricity and Electronics I, II, III, may be substituted for 02.341, 02.342, 02.343 Materials I, II, III.

Heat Engineering Technology

Leading to the Degree of Associate in Engineering

The program in Heat Engineering Technology prepares the graduate to assume responsibilities related to the design, operation, and construction of engines and equipment in which there are thermodynamic, hydraulic, and mechanical forces. Typical examples are automobile, aircraft, and ship engines; boilers and furnaces; and heating, air conditioning, and ventilating devices. Employment opportunities are with architectural firms, engineering consultants, light and heavy mechanical industries, and other engineering and oriented organizations.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

Third Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
09.311, 09.312, 09.313	Engineering Graphics I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6

Third Year

02.304, 02.305, 02.306	Mechanics (Dynamics) I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
02.351, 02.352, 02.353	Thermodynamics I, II, III	6
09.314, 09.315, 09.316	Engineering Design I, II, III	6

Fourth Year

01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
02.354, 02.355, 02.356	Heat Transfer I, II, III	6
02.357, 02.358, 02.359	Heat Engineering I, II, III	6
02.361, 02.362, 02.363	Heat Technology Lab. I, II, III	6
	Total A.E. Degree	96

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Mechanical Engineering Technology

(Accredited by Engineers' Council for Professional Development)

Leading to the Degree of Bachelor of Engineering Technology

The program in Mechanical Engineering Technology prepares the graduate to assume broad responsibilities related to the design, development, production, operation, and installation of all kinds of machinery, engines, and transportation equipment as well as boilers, furnaces, and heating or air conditioning equipment which involve interactions of mechanical, hydraulic, and thermodynamic forces. Employment opportunities are in industry producing mechanized and automated equipment, in design and engineering organizations, and in companies dealing primarily with manufacture and production.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

09.311, 09.312, 09.313	Engineering Graphics I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
30.601, 30.602	Composition and Rhetoric I, II	4
	English Elective	2

Third Year

02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
02.341, 02.342, 02.343	Materials I, II, III	6
09.314, 09.315, 09.316	Engineering Design I, II, III	6
	*Elective I, II, III	6

Fourth Year

01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
02.304, 02.305, 02.306	Mechanics (Dynamics) I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6

*Before registering for any electives, the student should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his personal career objectives—for approval by the Academic Standing Committee.

10.324, 10.325, 10.326 Differential Equations I, II, III is recommended for all students planning advanced engineering technology subjects.

Fifth Year

02.324, 02.325, 02.326	Advanced Stress Analysis I, II, III	6
02.351, 02.352, 02.353	Thermodynamics I, II, III	6
04.381, 04.382, 04.383	Nuclear Technology I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6

Sixth Year

02.327, 02.328, 02.329	Mechanical Design I, II, III	6
02.354, 02.355, 02.356	Heat Transfer I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
	**Elective I, II, III	6

Seventh Year

02.331, 02.332, 02.333	Mechanical Technology Labs. I, II, III	6
02.357, 02.358, 02.359	Heat Engineering I, II, III	6
	**Elective I, II, III	6

Eighth Year

02.361, 02.362, 02.363	Heat Technology Labs. I, II, III	6
30.604, 30.605	Introduction to Literary Forms I, II	4
	English Elective	2
	**Elective I, II, III	6

Total B.E.T. degree 180

Suggested Technical Electives

		Q.H.
02.337, 02.338, 02.339	Mechanical Vibrations I, II, III	6
03.320, 03.321, 03.322	Electricity and Electronics I, II, III	6
02.334, 02.335, 02.336	Experimental Stress Analysis I, II, III	6
02.344, 02.345, 02.346	Applied Metallurgy I, II, III	6
02.347	Principles of Aerodynamics	4
†93.402, 93.403	Technical Communications I, II	4

Transfer students may petition for elective credits for courses that are suitable to the curriculum.

Graduates of the Bachelor of Engineering Technology program desiring to pursue programs leading to the Bachelor of Science in Engineering degree at Northeastern University may apply through the Admissions Office (150 RI). Programs in Electrical and Civil Engineering are available on a part-time as well as a regular cooperative program. Industrial, Chemical, and Chemical Engineering programs are available only during the regular day programs.

Candidates must have at least a 2.75 cumulative average and complete a course program prescribed by the major department and the Dean's Office.

**Elective courses for which proper preparation exists may be chosen from within or outside of the Mechanical Engineering discipline.

†93.402, 93.403 Technical Communications I, II may be used to fulfill English elective requirements.

Mechanical Engineering Technology

(Day Cooperative Curriculum)

Leading to the Degree of Bachelor of Engineering Technology

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12
30.113	Freshman Writing	4
30.114, 30.115	Introduction to Lit., Great Themes in Lit.	8
09.421, 09.422, 09.423	Principles of Computer Programming I, II, III	6
09.461, 09.462, 09.463	Engineering Design Graphics I, II, III	6
11.373, 11.374	Physics Labs. I, II	4

Second Year

10.421, 10.422	Calculus A, B	8
02.411, 02.412	Mechanics A, B	8
09.464	Engineering Design Graphics IV	4
02.414	Stress Analysis A	4
02.431	Materials A	4
02.461	Machine Shop (or Liberal Arts elective on petition with experience)	4

*Third Year

02.413	Mechanics C	4
03.420	Electricity & Electronics I	4
02.415	Stress Analysis B	4
02.465	Heat Lab. I	2
02.462	Mechanical Lab. I	2
02.421, 02.422	Thermodynamics A, B	8
39.115	Principles of Economics	4
02.441	Fluid Mechanics A	4

Fourth Year

02.417, 02.418	Mechanical Design A, B	4&2
02.463, 02.464	Mechanical Labs. II, III	4
02.442	Fluid Mechanics B	2
02.423	Thermodynamics C	4
(I) (II)	Technical Elective I, II	8
(I)	BA Elective or Industrial Engineering Elect. I	4
(II)	Liberal Arts Elective II	4

*Note: Students desiring to terminate their program at the end of Quarter 7 may petition to be awarded the Associate in Engineering degree.

Fifth Year

Course Number	Course	Q.H.
04.481	Nuclear Technology	4
02.467	Project Lab.	4
02.466	Heat Lab. II	2
(II)	Technical Elective II	4
02.424	Thermodynamics D	2
(I) (II)	Technical Elective I, II	8
(I) (II)	Liberal Arts Elective I, II	8
	Total B.E.T. degree	180

Technical Electives Must Be Chosen From the Following List

02.416	Stress Analysis C	4
02.452	Exp. Stress Analysis	4
02.451	Mech. Vibrations	4
02.432	Materials B	4
02.433	Applied Metallurgy	4
02.425	Thermodynamics E	4
10.423	Differential Equations	4
03.421	Elect. & Electronics II	4
03.490	Optical Instrumentation	4

Graduates of the Day Bachelor of Engineering Technology program who have maintained a superior level of achievement and who wish to continue their academic studies may be qualified to enter the part-time or full-time program leading to the Bachelor of Science in Engineering. For further information contact the Lincoln College Office at 219 Hayden Hall, telephone 437-2500.

INTERDISCIPLINARY ENGINEERING AND SCIENCE TECHNOLOGY PROGRAMS

These programs offered by Lincoln College present a variety of interdisciplinary combinations of the Engineering Technology Programs and the Science Programs (chemistry, physics, and mathematics). They have been developed to meet the need for technologists in the areas of ecology, bioelectronic devices, computer systems, and other technological applications requiring an expertise in several of the academic disciplines.

This demand for multi-skilled technologists reflects the increased reliance of society on the science and engineering technologist to help solve its growth problems. Opportunities are also developing in highly interdisciplinary fields such as ocean engineering, bioengineering, environmental science, and public health.

The programs are designed to prepare the student to meet the charge of interfacing technology and society. The engineering technology student not only learns about the disciplines that are related to his expertise but he also becomes oriented in the disciplines to which his technological skills will be applied. A program of concentrated study in chemistry and physics or mathematics and physics is offered to the science technology student.

Lincoln College also offers an Associate in Science Degree Program in Fire Technology which provides a broad spectrum of those science technologies which are basic in coping with fire-fighting problems attendant to the complexities of today's society.

Interdisciplinary Engineering and Science Technology programs offered to Lincoln College students are:

Associate in Science Degree

Chemical-Physical Technology ..... page 97
Mathematical-Physical Technology ..... page 98
Fire Technology ..... page 99

Associate in Engineering Degree

Bioelectronic Engineering Technology ..... page 100
Computer Engineering Technology ..... page 101

Post-Associate Degree Certificate

Control Systems Engineering Technology .. .. page 102

Bachelor of Engineering Technology Degree

Environmental Control Technology ..... pages 103-104
Mechanical-Structural Engineering Technology ..... pages 105-106

Chemical–Physical Technology

Leading to the Degree of Associate in Science

The program in Chemical–Physical Technology prepares the graduate to assume responsibilities related to the analysis, synthesis, and production of products involving chemical as well as physical changes. The curriculum provides both theoretical and laboratory training in the traditional branches of chemistry, and also includes modern instrumental, radiochemistry, and nuclear technology. It provides broad rather than specialized training so as to have applicability in many chemistry-related fields. Employment opportunities are in manufacturing and pharmaceutical plants producing drugs, oils, synthetics, and plastics, and in private and industrial research laboratories concerned with the development of processes, by-products, and new knowledge.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.304, 11.305, 11.306	General Physics I, II, III	6
12.544, 12.545, 12.546	General Chemistry I, II, III	6
12.547, 12.548, 12.549	General Chemistry Labs. I, II, III	3

Second Year

10.321, 10.322, 10.323	Calculus II, III, IV	6
12.521, 12.522, 12.523	Analytical Chemistry I, II, III	6
12.524, 12.525, 12.526	Analytical Chemistry Labs. I, II, III	6
30.601, 30.602	Composition and Rhetoric I, II	4
	English Elective	2

Third Year

12.531, 12.532, 12.533	Organic Chemistry I, II, III	6
12.534, 12.535, 12.536	Organic Chemistry Labs. I, II, III	6
11.331, 11.332, 11.333	Modern Physics I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6

Fourth Year

12.541, 12.542, 12.543	Physical Chemistry I, II, III	6
12.551, 12.552, 12.553	Instrumental and Radiochemistry	6
04.381, 04.382, 04.383	Nuclear Technology I, II, III	6
	Elective I, II, III	6
	Total A.S. degree	99

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Mathematical–Physical Technology

Leading to the Degree of Associate in Science

The program in Mathematical–Physical Technology is designed to establish a firm background in the concepts of physics and mathematics with sufficient chemistry to allow effective communication between technologist and professional. The intensity of courses introduces theoretical depth for concept development but places emphasis at the level of application and performance.

Graduates may serve as high-level technicians and laboratory assistants in such fields as environmental and space science. Working with the professional engineer or scientist, he may assist in performing intricate and detailed experiments; collect, organize, and reduce technical data to manageable form for analysis; or perform investigations requiring mathematical and scientific backgrounds. Opportunities exist in the wide spectrum of research and development organizations which deal in the physical, mathematical, and engineering sciences.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

10.321, 10.322, 10.323	Calculus II, III, IV	6
11.321, 11.322, 11.323	Wave Phenomena, Semiconductor Physics, Semiconductor Devices	6
12.544, 12.545, 12.546	General Chemistry I, II, III	6
12.547, 12.548, 12.549	General Chemistry Labs. I, II, III	3
30.661, 30.602	Composition & Rhetoric I, II	4
	English Elective	2

Third Year

09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.324, 10.325, 10.326	Differential Equations I, II, III	6
03.307, 03.308, 03.309	Electricity & Electronics I, II, III	6
	Technical Elective I, II, III	6

Fourth Year

10.351, 10.352, 10.353	Advanced Mathematics I, II, III	6
11.331, 11.332, 11.333	Modern Physics I, II, III	6
11.373, 11.374, 03.323	Physics Laboratory I, II, Electronics Lab.	6
	Elective I, II, III	6

Total A.S. degree 99

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Fire Technology

Leading to the Degree of Associate in Science

The program in Fire Technology is designed to prepare students to assume responsibilities in such areas as fire investigation, industrial fire prevention and protection, and residential fire safety and prevention. A broad array of engineering technologies is an integral part of the student's program as a preparation for coping with new building techniques, present-day industrial operations, and the related complexities of the fire services.

The curriculum includes 72 quarter hours of credit in science and mathematics including physics, chemistry, and basic engineering courses. The balance of 24 quarter hours is made up of professional courses taught by specialists in this field, bringing to the program a real insight into fire science technology.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or Basic Mathematics I and II courses (10.330 and 10.331). The Mathematics Placement Test must be taken prior to registration.

Course Number	Course	Q.H.
First Year		
10.327, 10.328, 10.329	Mathematics I, II, III	6
11.304, 11.305, 11.306	General Physics I, II, III	6
91.301, 91.302	Fire Protection Science I, II	4
91.303	Chemical Behavior of Fire	2
12.507, 12.508, 12.509	Modern Chemistry I, II, III	6
Second Year		
02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6
10.320, 10.321, 10.322	Calculus I, II, III	8
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
91.304, 91.305	Fire Prevention I, II	4
Third Year		
01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
02.351	Thermodynamics I	2
03.344	Fundamentals of Electricity and Residential Power Circuits	2
03.345	Industrial Power Circuits	2
91.306	Fire Apparatus Function and Design	2
91.307, 91.308	Fire Protection Systems I, II	4
Fourth Year		
01.351	Environmental Engineering	2
09.311, 09.312	Engineering Graphics I, II	4
04.381, 04.382	Nuclear Technology I, II	4
91.312	Environmental Physiology	2
45.570, 45.571, 45.572	Electronic Data Processing I, II, III	6
91.309, 91.310, 91.311	Fire Operations I, II, III	6
	Total A.S. degree	96

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Bioelectronic Engineering Technology

Leading to the Degree of Associate in Engineering

The program in Bioelectronics Engineering Technology prepares the graduate to assume responsibilities related to the design, installation, and operation of modern medical electronic devices used in the measurement, recording, and analysis of anatomical, physiological, and biochemical functions in humans and animals. The curriculum builds heavily on electronics theory, chemistry, and human physiology with emphasis on typical bioelectronic devices and their laboratory applications. Employment opportunities are in biological, chemical, physiological, and pharmaceutical research laboratories; in clinics and hospitals in relation to medical diagnosis and patient care; and in industrial organizations concerned with the design, development, and production of the equipment.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra and Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

03.301, 03.302, 03.303	Circuit Theory I, II, III	6
09.307, 09.308, 09.309	Electrical and Electronic Graphics I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
12.507, 12.508, 12.509	*Modern Chemistry I, II, III	6

Third Year

03.304, 03.306, 03.323	Circuit Theory IV, Electrical Measurements, and Electronic Lab.	6
11.320	Semiconductor Physics and Devices	4
03.311, 03.312	Electronics I, II	8
18.507, 18.508, 18.509	Gross Anatomy and General Physiology I, II, III	6

Fourth Year

03.351, 03.352, 03.353	Bioelectronic Devices I, II, III	6
03.357, 03.358, 03.359	Bioelectronic Labs. I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
	Technical Elective	6
	Total A.E. degree	96

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

*Student may elect to substitute 12.544, 12.545, 12.546 General Chemistry and 12.547, 12.548, 12.549 General Chemistry Laboratory I, II, III (9 q.h.)

Computer Engineering Technology

Leading to the degree of Associate in Engineering

The Computer Engineering Technology program is organized to provide the mathematical and technological background for understanding both the hardware and software aspects of computer systems. Graduates will be prepared as: a) programmers who translate engineering or scientific concepts into meaningful form for the computer; b) engineering technicians concerned with the development, specification, production, and operation of computer hardware; and c) applications technicians dealing with the interface of the computer with industrial process and control systems or data acquisition, reduction, and display systems.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

10.321, 10.322, 10.323	Calculus II, III, IV	6
03.301, 03.302, 03.303	Circuit Theory I, II, III	6
09.307, 09.308, 09.309	Electrical & Electronic Graphics I, II, III	6
09.351, 09.352, 09.353	Princ. of Computer Programming I, II, III	6

Third Year

11.320	Semiconductor Physics & Devices and	4
03.311, 03.312	Electronics I, II	8
09.354, 09.355, 09.356	Computer Systems I, II, III	6
10.324, 10.325, 10.326	Differential Equations I, II, III	6

Fourth Year

03.323, 03.391, 03.392	Electronic Labs. & Computer Technology Labs. II, III	6
03.371, 03.372, 03.373	Analog, Digital and Hybrid Comps. I, II, III	6
	Any 2 of 4	
03.387, 03.388, 03.389	Active Integrated Circuits I, II, III	6
09.357, 09.358, 09.359	Computer Aided Design I, II, III	6
09.361, 09.362, 09.363	Computer Controlled Systems I, II, III	6
10.351, 10.352, 10.353	Advanced Mathematics I, II, III	6

Note: Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degree.

Control Systems Engineering Technology

Leading to a Certificate

The program in Control Systems Engineering Technology is designed to provide electrical and electronic background required in the development of control equipment and systems related to the age of automation. Practicing engineers who wish to avoid technological obsolescence may keep abreast of current control practices. The program presumes graduation from either associate in engineering degree programs in Electrical Power or Electronic Engineering Technology, or bachelor degree programs in a branch of engineering. A certificate will be awarded upon completion of 30 quarter hours of credit and a minimum overall Q.P.A. requirement of 1.8 in Lincoln College.

Required Courses

Course Number	Course	Q.H.
03.361, 03.362, 03.363	Transients in Linear Systems I, II, III	6
10.324, 10.325, 10.326	Differential Equations I, II, III	6

Full-Year Elective Sequences

(Require completion of Transients in Linear Systems)

03.364, 03.365, 03.366	Advanced Circuit Theory I, II, III	6
03.367, 03.368, 03.369	Advanced Pulse and Digital Circuits I, II, III	6
03.371, 03.372, 03.373	Analog, Digital, and Hybrid Computers I, II, III	6
03.374, 03.375, 03.376	Digital Systems I, II, III	6
03.377, 03.378, 03.379	Control Systems I, II, III	6
03.381, 03.382, 03.383	Transistor Circuit Engineering I, II, III	6
03.384, 03.385, 03.386	Microwave Semiconductor Devices and Circuits I, II, III	6
03.387, 03.388, 03.389	Active Integrated Circuits I, II, III	6
03.314, 03.315, 03.316	Pulse and Digital Circuits I, II, III	6

Environmental Control Technology

Leading to the degree of Bachelor of Engineering Technology

This program is designed to meet the increasing demand for qualified manpower to operate and maintain facilities and services which relate to the control of our environment. From work ranging from air sampling to water treatment and industrial waste control, graduates will take important positions now waiting to be filled.

The program is unique in its mixture of physical and physiological sciences. In addition, the student has the option of selecting technical electives which are oriented toward physical facilities or the study of the user of the facilities —man.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trig. I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

30.601, 30.602	Composition & Rhetoric I, II	4
18.511, 18.512, 18.513	Biology I, II, III	12
12.544, 12.545, 12.546	Gen. Chemistry I, II, III	6
12.547, 12.548, 12.549	Gen. Chem. Labs. I, II, III	3

Third Year

12.521, 12.522, 12.523	Analytical Chem. I, II, III	6
18.521, 18.522, 18.523	Microbiology I, II, III	12
02.301, 02.302, 02.303	Mechanics (Statics) I, II, III	6

Fourth Year

01.380, 01.381, 01.382	Environmental Labs. I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Prog. I, II, III	6
01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6

Fifth Year

10.321, 10.322, 10.323	Calculus II, III, IV	6
09.311, 09.312, 09.313	Engineering Graphics I, II, III	6
18.561, 18.562, 18.563	Ecology I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6

Sixth Year

Course Number	Course	Q.H.
39.501, 39.502, 39.503	Economic Principles & Prob. I, II, III	6
02.341, 02.342, 02.343	Materials I, II, III	6
18.524, 18.525, 18.526	Tech. Elective — Human Anat. & Physiology or	9
01.324, 01.325, 01.326	Tech. Elective — Structural Analysis	6
	Liberal Arts Elective	6

Seventh Year

01.383, 01.384, 01.385	Public Health Engineering 1, II, III	6
02.351, 02.352, 02.353	Tech. Elective — Thermodynamics or	6
01.331, 01.332, 01.333	Tech. Elective — Design of Structures	6
	Liberal Arts Elective	6

Eighth Year

01.386, 01.387, 01.388	Environmental Design I, II, III	6
02.357, 02.358, 02.359	Tech. Elective — Heat Engineering or	6
01.371, 01.372, 01.373	Tech. Elective — Reinf. Concrete Design	6
	Liberal Arts Elective	6
	Total B.E.T. Degree	181 or 184

Transfer students may petition for elective credits for courses that are suitable to the curriculum.

Graduates of the Bachelor of Engineering Technology program desiring to pursue programs leading to the Bachelor of Science in Engineering degree at Northeastern University may apply through the Admissions Office (150 RI). Programs in Electrical, Civil, and Mechanical Engineering are available on a part-time as well as a regular cooperative program. Industrial and Chemical Engineering programs are available only during the regular day programs.

Candidates must have at least a 2.75 cumulative average and complete a course program prescribed by the major department and the Dean's Office.

Mechanical–Structural Engineering Technology

(Accredited—Engineers' Council for Professional Development)

Leading to the Degree of Bachelor of Engineering Technology

The program in Mechanical–Structural Engineering Technology is interdisciplinary in that it prepares the graduate to assume responsibilities related to both the planning and construction of relatively static structures such as buildings, bridges, docks, etc., and also the design and production of dynamic machine tools, machinery, and other mechanical devices. The mechanical and structural content is integrated so as to be complementary and to provide a broad base for design problems of great variety. Employment opportunities lie in the architectural, construction, civil, and mechanical professions and companies.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302). The Mathematics Placement Test must be taken prior to registration.

First Year

Course Number	Course	Q.H.
10.307, 10.308	College Algebra & Trigonometry I, II	8
10.320	Calculus I	4
11.317, 11.318, 11.319	Physics I, II, III	12

Second Year

09.311, 09.312, 09.313	Engineering Graphics I, II, III	6
09.351, 09.352, 09.353	Principles of Computer Programming I, II, III	6
10.321, 10.322, 10.323	Calculus II, III, IV	6
30.601, 30.602	Composition and Rhetoric I, II	4
	English Elective	2

Third Year

01.301, 01.302, 01.303	Surveying I, II, II	6
02.301, 02.302, 02.303	Mechanics (Statics) 1, II, III	6
09.314, 09.315, 09.316	Engineering Design I, II, III	6
	*Elective I, II, III	6

Fourth Year

01.321, 01.322, 01.233	Introduction to Structures I, II, III	6
02.304, 02.305, 02.306	Mechanics (Dynamics) I, II, III	6
02.321, 02.322, 02.323	Stress Analysis I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6

*Before registering for any electives, the student should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his personal career objectives—for approval by the Academic Standing Committee.
10.324, 10.325, 10.326 Differential Equations I, II, III is recommended for all students planning advanced engineering technology subjects.

Fifth Year

01.324, 01.325, 01.326	Structural Analysis I, II, III	6
01.341, 01.342, 01.343	Fluid Mechanics I, II, III	6
02.341, 02.342, 02.343	Materials I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6

Sixth Year

01.331, 01.332, 01.333	Design of Structures I, II, III	6
02.324, 02.325, 02.326	Advanced Stress Analysis I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
	*Elective I, II, III	6

Seventh Year

01.371, 01.372, 01.373	Reinforced Concrete Design I, II, III	6
02.327, 02.328, 02.329	Mechanical Design I, II, III	6
	*Elective I, II, III	6

Eighth Year

02.331, 02.332, 02.333	Mechanical Technology Labs. I, II, III	6
30.604, 30.605	Introduction to Literary Forms I, II	4
	English Elective	2
	*Elective I, II, III	6
	Total B.E.T. degree	180

Suggested Technical Electives

01.361, 01.362, 01.363	Materials and Soil Mechanics	6
02.337, 02.338, 02.339	Mechanical Vibrations I, II, III	6
01.327, 01.328, 01.329	Advanced Structural Analysis I, II, III	6
02.351, 02.352, 02.353	Thermodynamics I, II, III	6
**93.402, 93.403	Technical Communications I, II	4

Elective courses for which proper preparation exists may be chosen from within or outside of the Mechanical-Structural Engineering discipline.

Transfer students may petition for elective credits for courses that are suitable to the curriculum.

Graduates of the Bachelor of Engineering Technology Program desiring to pursue programs leading to the Bachelor of Science in Engineering degree at Northeastern University may apply through the Admissions Office (150 RI). Programs in Electrical, Civil, and Mechanical Engineering are available on a part-time as well as a regular cooperative program. Industrial and Chemical Engineering programs are available only during the regular day programs.

Candidates must have at least a 2.75 cumulative average and complete a course program prescribed by the major department and the Dean's Office.

*Before registering for any electives, the student should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his personal career objectives—for approval by the Academic Standing Committee.
10.324, 10.325, 10.326 Differential Equations I, II, III is recommended for all students planning advanced engineering technology subjects.

**93.402, 93.403 Technical Communications I, II may be used to fulfill English elective requirements.

description of courses

On the pages which follow is a numerical and descriptive listing of courses offered in the several curricula of Lincoln College. Although not all courses are offered every year, all will be offered during the normal period of each student's curriculum. The term "prerequisite" indicates a course that must be taken before undertaking the advanced course to which it applies.

A "quarter hour" equals approximately three clock hours of work (ordinarily, one hour of class and two hours of preparation a week for a quarter of 12 weeks' duration). Laboratory and drawing courses normally require fewer hours of outside preparation and therefore carry less credit than lecture courses.

Abbreviations

prereq.—prerequisite
coreq.—corequisite
cl.—class hours
lab.—laboratory hours
q.h.—quarter hours

Policy on Changes of Program

Lincoln College reserves the right to cancel, modify, or add to the courses offered or to change the order or content of courses in any curriculum.

The University further reserves the right to change the requirements for graduation, tuition, and fees charged, and other regulations. However, no change in tuition and fees at any time shall become effective until the school year following that in which it is announced.

Any changes which may be made from time to time relative to the above policy shall be applicable to all students in the school, college, or department concerned, including former students who may re-enroll.

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CIVIL ENGINEERING TECHNOLOGY

01.301 Surveying I (2 cl., 2 q.h.)
Surveying principles; theory of measurements; basic traverse computation and adjustments and inverse leveling. *Preq. 10.308.*

01.302 Surveying II (2 cl., 2 q.h.)
Stadia principles and topography; simple and compound curves; area calculations. *Prereq. 01.301.*

01.303 Surveying III (2 cl., 2 q.h.)
Vertical curves, earthwork computations; solution of the mass diagram. *Prereq. 01.302.*

01.304 Advanced Surveying I (2 cl., 2 lab., 2 q.h.)
Introduction to observations for latitude, time azimuth including basic spherical trigonometry. *Prereq. 01.303.*

01.305 Advanced Surveying II (1 cl., 2 lab., 2 q.h.)
Precise leveling, triangulation, and base line measurements. Use of the geodimeter and telurometer. *Prereq. 01.304.*

01.306 Advanced Surveying III (1 cl., 2 lab., 2 q.h.)
Basic principles of photogrammetry and map making from aerial photographs. Map projections. *Prereq. 01.305.*

01.307 Legal Aspects of Surveying I (2 cl., 2 q.h.)
Registry of deeds and probate; ownership of land, deeds; descriptions and qualifying expressions; monument rule; metes and bounds; plans; apportionment. *Prereq. 01.303.*

01.308 Legal Aspects of Surveying II (2 cl., 2 q.h.)
Adverse possession; casement; title insurance; Massachusetts land court; expert witness. *Prereq. 01.307.*

01.309 Legal Aspects of Surveying III (2 cl., 2 q.h.)
Water rights; riparian rights; navigable vs non-navigable; Mill acts; surface water rules; zoning-subdivision control; zoning boards of appeal; acceptance of a town way; professional ethics of a land surveyor; registration law. *Prereq. 01.308.*

01.310 Surveying (2 cl., 2 q.h.)
An outdoor course in use of level, level circuit, vertical control, use of the transit, taping exercises, closed traverse—transit-tape, horizontal control, topography—stadia and plane table, layout problems, horizontal and vertical curves, spiral easements. *Prereq. 01.303* (Summer Session).

01.311 Highway Engineering I (2 cl., 2 q.h.)
Engineering considerations in the planning and construction of modern highways and highway routing. *Prereq. 01.301.*

01.312 Highway Engineering II (2 cl., 2 q.h.)
Rates of grade, superelevation, flexible and rigid pavements, and other features of highway design. *Prereq. 01.311.*

01.313 Highway Engineering III (2 cl., 2 q.h.)
Traffic flow and traffic control; computer applications to transportation problems. *Prereq. 01.312.*

01.314 Surveying Practice I (1 cl., 2 lab., 2 q.h.)
Computing and balancing a control traverse; calculating exact property lines; vertical control survey; plotting from topographic field notes. *Prereq. 01.303.*

01.315 Surveying Practice II (1 cl., 2 lab., 2 q.h.)
Scale drawing of the proposed subdivision; making calculations of the subdivision required by the land court; street profiles showing grades; drainage study. *Prereq. 01.314.*

01.321 Introduction to Structures I (1 cl., 2 lab., 2 q.h.)
Framing plans and details for steel structures. *Prereq. 09.313 and 02.303.*

01.322 Introduction to Structures II (1 cl., 2 lab., 2 q.h.)
Structural shop drafting and the evaluation of load capacities of rivets, welds, and bolts for structural connections using the AISC code. *Prereq. 01.321.*

01.323 Introduction to Structures III (1 cl., 2 lab., 2 q.h.)
Design and detailing of joints including standard connections, seats, and brackets. *Prereq. 01.322.*

01.324 Structural Analysis I (2 cl., 2 q.h.)
Reactions, shears, bending moments, and forces developed by loads on beams and trusses; analytical and graphical methods. *Prereq. 02.323.*

01.325 Structural Analysis II (2 cl., 2 q.h.)
Influence lines for beams, girders, and trusses; solutions for forces from moving load system on statically determinate structures. *Prereq. 01.324.*

01.326 Structural Analysis III (2 cl., 2 q.h.)
Introduction to classical methods of deflection solutions of beams and trusses. Methods of solving statically indeterminate structures. *Prereq. 01.325.*

01.327 Advanced Structural Analysis I (2 cl., 2 q.h.)
Analysis of indeterminacy and instability; analysis of statically indeterminate structures using Castigliano, virtual work, methods of deflections, and the neutral point methods. *Prereq. 01.326.*

01.328 Advanced Structural Analysis II (2 cl., 2 q.h.)
Analysis of statically indeterminate structures using the column analogy, moment, area, elastic weights, and conjugate structures. *Prereq. 01.327.*

01.329 Advanced Structural Analysis III (2 cl., 2 q.h.)
Analysis of statically indeterminate structures using Williot-Mohr, slope deflection, and moment distribution. *Prereq. 01.328.*

01.331 Design of Structures I (2 cl., 2 q.h.)
Design of steel members in structural frames; tension, compression, bending, and eccentrically loaded members. *Prereq. 01.323 and 02.323.*

01.332 Design of Structures II (2 cl., 2 q.h.)
Design of plate girders, highway bridge decks, and roof-framing systems. *Prereq. 01.331.*

01.333 Design of Structures III (2 cl., 2 q.h.)
Composite design in bridges and buildings; introduction to plastic design methods in steel. *Prereq. 01.332.*

01.334 Advanced Structural Design I (2 cl., 2 q.h.)
Design of continuous frames in structural steel, moment resistant connections, and column bases. *Prereq. 01.326, 01.333, 01.373.*

01.335 Advanced Structural Design II (2 cl., 2 q.h.)
Design of continuous frames in reinforced concrete; introduction to prestressed concrete member design. *Prereq. 01.334.*

01.336 Advanced Structural Design III (2 cl., 2 q.h.)
Design of foundations for structures; spread footings, combined footings, mats and pile foundations. *Prereq. 01.335.*

01.341 Fluid Mechanics I (2 cl., 2 q.h.)
Hydrostatics; principles governing fluids at rest; pressure measurement; hydrostatic forces on submerged areas and objects; simple dams; fluids in moving vessels; hoop tension. *Prereq. 02.303.*

01.342 Fluid Mechanics II (2 cl., 2 q.h.)
Fluid dynamics; kinematics of flow; continuity, momentum, and energy equations; orifices; pi theorem; laminar and turbulent flow. *Prereq: 01.341.*

01.343 Fluid Mechanics III (2 cl., 2 q.h.)
Flow in closed conduits using Moody diagram; empirical formulae for closed conduit flow; minor losses; compound pipe systems; open channel flow and Manning formula; specific energy and stage relationships; fluid measurement systems. *Prereq. 01.342.*

01.351 Environmental Engineering (2 cl., 2 q.h.)
Principles of water supply engineering; population forecasting; quality and quantity of water for various uses; water treatment processes. *Prereq. 01.343 and 12.546 or 12.509.*

01.352 Environmental Engineering II (2 cl., 2 q.h)
Collection and disposal of wastewater and storm water; modern methods of treatment and wastewater plant operation. *Prereq. 01.351.*

01.353 Environmental Engineering III (1 cl., 2 lab., 2 q.h.)
Layout and design of water treatment and sewage treatment plants. Instrumentation and electrical equipment. *Prereq. 01.352.*

01.361 Materials and Soil Mechanics I
Physical properties of Portland cement, aggregates, mixing water, and admixtures; proportioning of batches; mixing, placing, and finishing of concrete; bituminous materials. *Prereq. 02.303.*

01.362 Materials and Soil Mechanics II
Index properties, soil moisture, and structure; compressibility, theory of consolidation. *Prereq. 01.361.*

01.363 Materials and Soil Mechanics III
Shearing strength of soils, stress analysis, settlement calculations; lateral earth pressures, bearing capacity of shallow footings; soil compaction, stabilization and site investigation. *Prereq. 01.362.*

01.364 Materials & Soil Mechanics Lab. (2 cl., 2 q.h.)
Grain size analysis; variables in concrete mix; bituminous testing, specific gravity—CBR optimum moisture; direct shear, consolidation; seepage and flow nets; unconfined compression test. *Prereq. 01.363.*

01.371 Reinforced-Concrete Design I (2 cl., 2 q.h.)
Design of bending members in reinforced concrete, using elastic and ultimate-strength theories. *Prereq. 02.323.*

01.372 Reinforced-Concrete Design II (2 cl., 2 q.h.)
Design of axially and eccentrically loaded columns by elastic and ultimate strength principles. *Prereq. 01.371.*

01.373 Reinforced-Concrete Design III (2 cl., 2 q.h.)
Reinforced-concrete design of basic structures including consideration of continuity. *Prereq. 01.372.*

01.380 Environmental Lab. 1 ($2^1/_2$ lab., 2 q.h.)
Methods and techniques for the examination of water. Treatment efficiency is included for various types of water treatment. *Prereq. 12.546 or equiv.*

01.381 Environmental Lab. II ($2^1/_2$., 2 q.h.)
Methods and techniques for the examination of wastewater and industrial waste discharges. Both chemical and bacteriological analysis are included.

01.382 Environmental Lab. III ($2^1/_2$ lab., 2 q.h.)
Advanced methods of measuring impurities in air, water, and solid waste discharges.

01.383 Public Health Engineering I (2 cl., 2 q.h.)
The principles and practice of public health engineering. Administrative and legal aspects of public health quality control.

01.384 Public Health Engineering II (2 cl., 2 q.h.)
Standard methods employed in public health evaluations of foods, dairy products, drinking water, shellfish, air, and recreational waters.

01.385 Public Health Engineering III (2 cl., 2 q.h.)
Engineering control of air pollution, refuse disposal, institutional sanitation, insect vectors, and rodent control.

01.386 Environmental Design I (2 cl., 2 q.h.)
Lecture and design problems in environmental quality, water resources, and waste treatment.

01.387 Environmental Design II (2 cl., 2 q.h.)
Lecture and design problems in wastewater treatment, chlorination, and water pollution control.

01.388 Environmental Design III (2 cl., 2 q.h.)
Lecture and design problems in air pollution control, solid waste disposal, and industrial waste disposal.

01.390 Construction Administration (2 cl., 2 q.h.)
Contract, specifications, and bidding procedures; estimating and scheduling,

including the critical path method; discussion of personnel administration and union negotiation. *Prereq. none.*

01.393 Architectural Design I (2 cl., 2 q.h.)
Basic architectural design concepts; proportion, scale, form, massing, color, texture, lighting; lecture and drawings. *Prereq. none.*

01.394 Architectural Design II (2 cl., 2 q.h.)
Orientation of structures; site organization; selection of building materials; consideration of the building process. *Prereq. 01.393.*

01.395 Architectural Design III (2 cl., 2 q.h.)
Basic architectural design projects assigned by the instructor. *Prereq. 01.394.*

01.401 Technology of Modern Architecture I (2 cl., 2 q.h.)
General background of architectural styles both historical and contemporary, with emphasis on engineering design aspects and construction procedures of various types of buildings. *Prereq. none.*

01.402 Technology of Modern Architecture II (2 cl., 2 q.h.)
Contemporary architecture, emphasizing the engineering design aspects and construction procedures required for modern buildings. *Prereq. none.*

MECHANICAL ENGINEERING TECHNOLOGY

02.301 Mechanics I (Statics) (2 cl. 2 q,h.)
Forces, moments, couples, statics of particles, and rigid bodies in two and three dimensions. *Prereq. 10.320 and 11.317.*

02.302 Mechanics II (Statics) (2 cl., 2 q.h.)
Distributed forces—external and internal; first moments and centroids; analysis of structures—trusses, frames, and machines. *Prereq. 2.301.*

02.303 Mechanics III (Statics) (2 cl., 2 q.h.)
Friction, second moments, and virtual work. *Prereq. 02.302.*

02.304 Mechanics I (Dynamics) (2 cl., 2 q.h.)
Kinematics of particles—rectilinear and curvilinear motion of dynamic particles—force; mass and acceleration; work and energy. *Prereq. 02.303.*

02.305 Mechanics II (Dynamics) (2 cl., 2 q.h.)
Impulse and momentum of particles; kinematics and dynamics of rigid bodies —force mass and acceleration. *Prereq. 02.304.*

02.306 Mechanics III (Dynamics) (2 cl., 2 q.h.)
Dynamics of rigid bodies—work and energy, impulse and momentum; introduction to mechanical vibration. *Prereq. 02.305.*

02.307 Mechanics Statics (4 cl., 4 q.h.)
Forces, moments, couples, statics of particles, and rigid bodies in three dimensions; distributed forces—external and internal; first moments and

centroids; analysis of structures, second moments, and virtual work. *Prereq. 10.320 and 11.317.*

02.321 Stress Analysis I (2 cl., 2 q.h.)
Stress and deformation; mechanical properties of materials; allowable stresses and factor of safety; axially loaded indeterminate members; effects of temperature on stresses and strains; thin cylinders and spheres; riveted and welded joints. *Prereq. 02.302.*

02.322 Stress Analysis II (2 cl., 2 q.h.)
Shear and bending moment in beams; flexural and transverse shearing; stresses in beams; design of beams. *Prereq. 02.321.*

02.323 Stress Analysis III (2 cl., 2 q.h.)
Determinate and indeterminate beam deflections and reactions by numerical and graphical integration and area moment methods; theorem of three moments. *Prereq. 02.322.*

02.324 Advanced Stress Analysis I (2 cl., 2 q.h.)
Torsional stresses and strains; power transmission; eccentric loads on struts, beams, riveted and welded joints; combined stresses, principal stresses, Mohr's circle; theories of failure. *Prereq. 02.323.*

02.325 Advanced Stress Analysis II (2 cl., 2 q.h.)
Curved beams; non-symmetrical bending of beams; shear-center and shear stresses on thin sections; composite beams. *Prereq. 02.324.*

02.326 Advanced Stress Analysis III (2 cl., 2 q.h.)
Columns; energy absorption and resilience; dynamic loading; deflection of beams by energy methods; bolted fastenings. *Prereq. 02.324.*

02.327 Mechanical Design I (2 cl., 2 q.h.)
Introduction and principles of design, properties and selection of materials; stress concentrations; strength under combined stresses; theories of failure; impact and fluctuating and repeated loads. *Prereq. 02.306, 02.323.*

02.328 Mechanical Design II (2 cl., 2 q.h.)
Stresses; deformation and design of fasteners, screws, joints, springs, and bearings; lubrication and journal bearings. *Prereq. 02.327.*

02.329 Mechanical Design III (2 cl., 2 q.h.)
Stresses and power transmission of spur, bevel, and worm gear; shaft design; clutches and brakes. *Prereq. 02.327.*

02.331 Mechanical Technology Laboratory I ($2\frac{1}{2}$ lab., 2 q.h.)
Experiments concerning the physical properties of materials; instrumentation and measurement. *Prereq. 02.343, 02.324 or concurrently.*

02.332 Mechanical Technology Laboratory II ($2\frac{1}{2}$ lab., 2 q.h.)
Experiments concerning compressible and incompressible fluids; experimental techniques. *Prereq. 02.331, 01.341.*

02.333 Mechanical Technology Laboratory III ($2^1/_2$ lab., 2 q.h.)
Experiments of a more advanced nature; introduction to the analog computer and experimental stress analysis. *Prereq. 02.332, 02.325.*

02.334 Experimental Stress Analysis I (2 cl., 2 q.h.)
Theory and experimentation showing the application of extensometers and electrical strain gages as transducers and in the field of experimental stress and strain analysis. *Prereq. 02.324.*

02.335 Experimental Stress Analysis II (2 cl., 2 q.h.)
Theory and laboratory practice of photoelastic methods as applied to classical model analysis and modern coating analysis. *Prereq. 02.334.*

02.336 Experimental Stress Analysis III (2 cl., 2 q.h.)
The use of resinous and ceramic brittle coatings in experimental analysis; Moiré method of strain analysis; statistical treatment of experimental data. *Prereq. 02.335.*

02.337 Mechanical Vibrations I (2 cl., 2 q.h.)
Elements of vibrating systems, one degree of freedom (undamped free and forced vibration from Newton's law of motion and energy methods); natural frequencies; damped free and forced vibration; impedance and mobility. *Prereq. 02.306.*

02.338 Mechanical Vibrations II (2 cl., 2 q.h.)
Systems with more than one degree of freedom; influence coefficients, Lagrange's equations, generalized coordinates, vibration absorber. *Prereq. 02.337.*

02.339 Mechanical Vibrations III (2 cl., 2 q.h.)
Natural frequencies by Rayleigh methods and Holzer methods for multi-degree of freedom; application problems with combined rotation and translation; Laplace transforms and electro-mechanical analogs. *Prereq. 02.338.*

02.341 Materials I (2 cl., 2 q.h.)
Lectures on: fundamental material structures, general information covering theoretical aspects of properties, testing and failure of materials supplemented by visual aids. *Prereq. none.*

02.342 Materials II (2 cl., 2 q.h.)
Lectures on: alloying and hardening of metals, refinement of metals, equilibrium diagrams, characteristics of engineering materials, principles of material fabrication. *Prereq. 02.341.*

02.343 Materials III (2 cl., 2 q.h.)
Lectures on: inorganic materials, i.e., polymers, glasses, ceramics, cements, wood; and materials having important electrical and magnetic properties; also a summary of the most up-to-date applications for the fabrication and uses of both metals and non-metals. *Prereq. 02.342.*

02.344 Applied Metallurgy I (1 cl., 1 lab., 2 q.h.)
Lectures: structures of metals, imperfections, phase diagrams, effect of temperature on structure and properties of metals (annealing, recrystallization,

recovery, precipitation, diffusion), strengthening mechanisms, mechanical properties of non-ferrous metals.

Laboratory: experiments in preparation of samples, selection, polishing, and etching; examination of non-ferrous metals; use of the microscope; linear analysis; construction of cooling curves and simple binary phase diagrams. *Prereq. 02.342.*

02.345 Applied Metallurgy II (1 cl., 1 lab., 2 q.h.)
Lectures: mechanical properties of ferrous metals, the iron carbon diagram, high temperature alloys, hardening methods, impact tests, effects of environment on metals.

Laboratory: experiments on analysis of stress-strain diagrams of iron and steel, heat treatment of steels, surface corrosion, tempering and drawing, use of metallograph and analysis of the results. *Prereq. 02.344.*

02.346 Applied Metallurgy III (1 cl., 1 lab., 2 q.h.)
Lectures: manufacturing processes, methods of fabrication; limitations on the use of different materials and processes; casting, welding, cutting, drawing, powder metallurgy.
Laboratory: experiments in cold rolling, swagging, drawing of non-ferrous metals and the analysis of the results; tension, shear, fatigue, and machinability tests on ferrous metals. *Prereq. 02.345.*

02.347 Principles of Aerodynamics (4 cl., 4 q.h.)
This is a first course in aerodynamics covering the fundamentals of theory and application. Material presented includes: properties of air, fluid flow principles, lift, drag, air foil, and wing theory; auxiliary lift devices; stability and control; and flight vehicle performance. *Prereq. 01.343.*

02.351 Thermodynamics I (2 cl., 2 q.h.)
General theory of energy and heat transfer; laws of thermodynamics; basic equations of energy transformation; thermodynamic properties and behavior of perfect gases; introduction to the Carnot cycle. *Prereq. 11.318.*

02.352 Thermodynamics II (2 cl., 2 q.h.)
Concepts of availability of energy steady and non-flow processes; theory of fluid flow through orifices and nozzles, and compression of gases; thermodynamic analysis of internal combustion engines including the Otto and Diesel Cycles. *Prereq. 02.351.*

02.353 Thermodynamics III (2 cl., 2 q.h.)
Combustion of fossil fuels for their energy transfer; thermodynamic properties and processes of liquids and vapors, tables and Mollier diagram; theory of vapor power cycles; analysis of external combustion engines including the Rankine and Brayton Cycles. *Prereq. 02.352.*

02.354 Heat Transfer I (2 cl., 2 q.h.)
The primary modes of heat transfer; thermal conductance/resistance concept; thermal-electrical anology; combined heat transfer mechanisms; basic equations of conduction; thermal conductivity; analytical solutions of various steady state conduction problems. *Prereq. 02.353.*

02.355 Heat Transfer II (2 cl., 2 q.h.)
Dimensional analysis and similarity considerations; natural and forced convection; hydrodynamic and thermal boundry layers; log-mean temperature differences; overall heat transfer coefficients; applications to heat exchangers. *Prereq. 02.354.*

02.356 Heat Transfer III (2 cl., 2 q.h.)
Black body radiation; Kirchoff's Law; emissivity and absorbtivity; radiation between simple bodies; graphical and numerical methods applied to steady state, conduction problems; radiation and convection effects; transient heat transfer; numerical methods applied to transient problems; heat transfer engineering problems. *Prereq. 02.355.*

02.357 Heat Engineering I (Refrigeration) (2 cl., 2 q.h.)
Principles of gas compression; analysis of vapor compression; refrigeration systems; low temperature refrigeration cycles; and absorption refrigeration systems. *Prereq. 02.353.*

02.358 Heat Engineering II (Air Conditioning) (2 cl., 2 q.h.)
Air conditioning principles including psychometrics and heat pumps; calculation of heating and cooling loads in accordance with A.S.H.R.A.E. practices. *Prereq. 02.353.*

02.359 Heat Engineering III (Turbines) (2 cl., 2 q.h.)
Design and performance of steam and gas turbines; spark-ignition and compression-ignition engine design and performance, fan performance. *Prereq. 02.353.*

02.361 Heat Technology Laboratory I ($2^1/_2$ lab., 2 q.h.)
Experiments illustrating principles of thermodynamics and heat transfer; instrumentation and measurement. *Prereq. 02.353.*

02.362 Heat Technology Laboratory II ($2^1/_2$ lab., 2 q.h.)
Experiments on various types of heat engines; experimental techniques. *Prereq. 02.361, 02.354 and 02.357.*

02.363 Heat Technology Laboratory III ($2^1/_2$ lab., 2 q.h.)
Experiments of a more advanced nature further illustrating the principles of thermodynamics and making use of the student's increased theoretical background; simulation of heat problems on analog computer. *Prereq. 02.362.*

02.401 Man and Materials (2 cl., 2 q.h.)
(See General Interest Courses, pages 162-163.)

02.411 Mechanics A (4 cl., 4 q.h.) (Day Curriculum)
Forces, moments, couples, statics of particles and rigid bodies in two and three dimensions; distributed forces—external and internal; first moments and centroids; analysis of structure—trusses, frames, and machines. *Prereq. 10.320, 11.317.*

02.412 Mechanics B (4 cl., 4 q.h.) (Day Curriculum)
Friction, second moments, and virtual work; kinematics of particles—recti-

linear and curvilinear motion of dynamic particles—force, mass and acceleration, work and energy. *Prereq. 02.411.*

02.413 Mechanics C (4 cl., 4 q.h.) (Day Curriculum)
Impulse and momentum of particles; kinematics and dynamics of rigid bodies —force, mass, and acceleration; dynamics of rigid bodies—work and energy, impulse and momentum; introduction to mechanical vibration. *Prereq. 02.412.*

02.414 Stress Analysis A (4 cl., 4 q.h.) (Day Curriculum)
Stress and deformation; mechanical properties of materials; allowable stresses and factor of safety; axially loaded indeterminate members; effects of temperature on stresses and strains; thin cylinders and spheres; riveted and welded joints; shear and bending moment in beams; flexural and transverse shearing; stresses in beams; design of beams. *Prereq. 02.411.*

02.415 Stress Analysis B (3 cl., 4 q.h.) (Day Curriculum)
Determinate and indeterminate beam deflections and reactions by numerical and graphical integration and area moment methods; theorem of three moments. Torsional stresses and strains; power transmission; eccentric loads on struts, beams, riveted and welded joints; combined stresses; principal stresses; Mohr's circle; theories of failure. *Prereq. 02.414.*

02.416 Stress Analysis C (4 cl., 4 q.h.) (Day Curriculum)
Curved beams; non-symmetrical bending of beams; short-center and shear stresses on thin sections; composite beams. Columns; energy absorption and resilience; inertial stresses impact loading; deflection of beams by energy methods. Bolted fastenings. *Prereq. 02.415.*

02.417 Mechanical Design A (4 cl., 4 q.h.) (Day Curriculum)
Failure criteria; properties and selection of materials; manufacturing considerations; stress concentrations; strength under combined stresses; theories of failure; impact; and fluctuating and repeated loads. Stresses; deformation and design of springs; screws, keys, pins, and interference fits; preloading of bolted joints; shafts and flywheels; friction brakes. *Prereq. 02.415.*

02.418 Mechanical Design B (2 cl., 2 q.h.) (Day Curriculum)
Lubrication and journal bearings; anti-friction bearings; stresses and power transmission of spur, bevel, and worm gear; screws for power transmission. *Prereq. 02.417.*

02.421 Thermodynamics A (4 cl., 4 q.h.) (Day Curriculum)
General theory of heat and matter; laws of thermodynamics; energy-transformation principles and availability of energy; properties and processes for pure substances and ideal gases. Thermodynamic properties and processes of liquids and vapors; tables and charts; mixtures of fluids; vapor cycles. *Prereq. 11.318.*

02.422 Thermodynamics B (4 cl., 4 q.h.) (Day Curriculum)
Theory of vapor engines and analysis of types of actual engines using compression of gases and vapors; internal combustion engines. Theory of gas and vapor flow through orifices and nozzles. Design and performance of steam and gas

turbines; spark-ignition and compression-ignition engine design and performance. Fan performance. *Prereq. 02.421.*

02.423 Thermodynamics C (4 cl., 4 q.h.) (Day Curriculum)
Air conditioning principles including psychometrics and heat pumps. Calculation of heating and cooling loads in accordance with A.S.H.R.A.E. practices. Principles of gas compression; analysis of vapor compression; refrigeration systems; low temperature refrigeration cycles; and absorption refrigeration systems. *Prereq. 02.422.*

02.424 Thermodynamics D (2 cl., 2 q.h.) (Day Curriculum)
The primary modes of heat transfer; thermal conductance/resistance concept; thermal-electrical analog; combined heat transfer mechanisms; basic equations of conduction; thermal conductivity; analytical solutions of various steady state conduction problems. *Prereq. 02.422.*

02.425 Thermodynamics E (4 cl., 4 q.h.) (Day Curriculum)
Dimensional analysis and similarity considerations; natural and forced convection; hydrodynamic and thermal boundary layers; log-mean temperatures differences; overall heat transfer coefficients; applications to heat exchangers. Black body radiation; Kirchoff's Law; emissivity and absorbtivity; radiation between simple bodies. Graphical and numerical methods applied to steady state; conduction problems; radiation and convection effects; transient heat transfer; numerical methods applied to transient problems; heat transfer engineering problems. *Prereq. 02.424.*

02.431 Materials A (4 cl., 4 q.h.) (Day Curriculum)
Lectures on: fundamental metallic structures; general metallurgical information covering theoretical aspects of properties; testing and failure of metals; supplemented by visual aids. Lectures on: alloying and hardening of metals; refinement of metals; equilibrium diagrams; characteristics of engineering metals; principles of metal fabrication. *Prereq. none.*

02.432 Materials B (4 cl., 4 q.h.) (Day Curriculum)
Lectures on: inorganic materials, i.e., polymers, glasses, ceramics, cements, wood, and materials having important electrical and magnetic properties; also a summary of the most up-to-date applications for the fabrication and uses of both metals and non-metals. Structures of metals; imperfections; phase diagrams; effect of temperature on structure and properties of metals (annealing, recrystallization, recovery, precipitation, diffusion); strengthening mechanisms; mechanical properties of non-ferrous metals.
Laboratory: experiments in preparation of samples, selection, polishing, and etching; examination of non-ferrous metals; use of the microscope; linear analysis; construction of cooling curves; and simple binary phase diagrams. *Prereq. 02.431.*

02.433 Applied Metallurgy (4 cl., 4 q.h.) (Day Curriculum)
Lectures on: mechanical properties of ferrous metals, the iron carbon diagram, high temperature alloys, hardening methods, impact tests, effects of environment on metals; manufacturing processes, methods of fabrication; limitations

on the use of different materials and processes; casting, welding, cutting, drawing, powder metallurgy.

Laboratory: experiments on analysis of stress-strain diagrams of iron and steel, heat treatment of steels, surface corrosion, tempering and drawing, use of metallograph and analysis of the results. Experiments in cold rolling, swaging, drawing of non-ferrous metals and the analysis of the results. Tension, shear, fatigue, and machinability tests on ferrous metals. *Prereq. 02.432.*

02.441 Fluid Mechanics A (4 cl., 4 q.h.) (Day Curriculum)
Hydrostatics, principles governing fluids at rest; pressure measurement; hydrostatic forces on submerged areas and objects; simple dams; fluids in moving vessels; hoop tension. Fluid flow in pipes under pressure; fluid energy, power and friction loss; Bernoulli's Theorem; flow measurement. *Prereq. 02.412.*

02.442 Fluid Mechanics B (2 cl., 2 q.h.) (Day Curriculum)
Pipe networks and reservoir systems; flow in open channels; uniform flow; energy, friction loss, minor losses, velocity distribution, alternate stages of flow, critical flow; non-uniform flow; accelerated and retarded flow; hydraulic jump and waves. *Prereq. 02.441.*

02.451 Mechanical Vibrations (4 cl., 4 q.h.) (Day Curriculum)
Elements of vibrating systems, one degree of freedom (undamped free and forced vibration from Newton's law of motion and energy methods); natural frequencies; damped free and forced vibration; impedance and mobility; systems with more than one degree of freedom; influence coefficients, Lagrange's equations, generalized coordinates, vibration absorber. *Prereq. 02.413.*

02.452 Experimental Stress Analysis (4 cl., 4 q.h.) (Day Curriculum)
Theory and experimentation showing the application of extensometers and electrical strain gauges as transducers in the field of experimental stress and strain analysis. Theory and laboratory practice on photoelastic methods as applied to classical model analysis and modern coating analysis. *Prereq. 02.415.*

02.461 Machine Shop (2 cl., 3 lab., 4 q.h.) (Day Curriculum)
Introduction to study of machines for metal processing, cutting tools, and fluids; machinability; automatic machinery. *Prereq. none.*

02.462 Mechanical Technology Laboratory I ($2\frac{1}{2}$ lab., 2 q.h.) (Day Curriculum)
Experiments concerning compressible and incompressible fluids; instrumentation and measurement. *Prereq. 02.441.*

02.463 Mechanical Technology Laboratory II ($2\frac{1}{2}$ lab., 2 q.h.) (Day Curriculum)
Experiments concerning the physical properties of materials; experimental techniques. *Prereq. 02.462, 02.415, 02.431.*

02.464 Mechanical Technology Laboratory III ($2\frac{1}{2}$ lab., 2 q.h.) (Day Curriculum)
Experiments of a more advanced nature; introduction to the analog computer and experimental stress analysis. *Prereq. 02.463.*

02.465 Heat Technology Laboratory I ($2\frac{1}{2}$ lab., 2 q.h.) (Day Curriculum)
Experiments illustrating principles of thermodynamics and heat transfer; instrumentation and measurement. *Prereq. 02.422 or concurrently.*

02.466 Heat Technology Laboratory II ($2^1/_2$ lab., 2 q.h.) (Day Curriculum)
Experiments on various types of heat engines; experimental techniques. *Prereq. 02.465, 02.424, or concurrently.*

02.467 Project Laboratory (6 cl., 4 q.h.) (Day Curriculum)
A project of analytical, design, or experimental nature. Must be approved by student's faculty adviser. A formal report must be submitted. *Prereq. 02.464, 02.466.*

ELECTRICAL ENGINEERING TECHNOLOGY

03.301 Circuit Theory I (2 cl., 2 q.h.)
Ohm's law; Kirchoff's current and voltage laws; equivalent resistances and sources; mesh and nodal analysis; network theorems; and power relations, all with respect to direct currents. *Prereq. 10.320 and 11.319.*

03.302 Circuit Theory II (2 cl., 2 q.h.)
Energy storage; singularity functions; response of R, L, and C elements to singularities. *Prereq. 03.301, 10.322 concurrently.*

03.303 Circuit Theory III (2 cl., 2 q.h.)
Complex algebra; phasors; frequency domain; mutual inductance; transformers; steady-state a-c theory; driving point and transfer impedances; power and energy in a-c circuits. *Prereq. 03.302.*

03.304 Circuit Theory IV (2 cl., 2 q.h.)
Laplace transforms; partial fraction expansion; Laplace transform techniques applied to the solution of RLC networks. *Prereq. 03.303.*

03.305 Circuit Theory V (2 cl., 2 q.h.)
Consideration of balanced and unbalanced polyphase power circuits; symmetrical components; harmonic analysis. *Prereq. 03.304.*

03.306 Electrical Measurements (2 cl., 2 q.h.)
Measurement of voltage, current, power, resistance, capacitance, inductance, impedance, frequency, etc.; direct and substitution measurements; evaluation of measured data—standard deviation and tolerance limits, instruments calibrations—effects of residual impedance. *Prereq. 03.304, 10.323.*

03.311 Electronics I (4 cl., 4 q.h.)
Semiconductor diodes, power supplies, and filters; transistors as amplifying devices; graphical analysis of basic amplifiers, d-c and a-c load lines; transistor biasing techniques. *Prereq. 03.303, 11.323 or 11.320.*

03.312 Electronics II (4 cl., 4 q.h.)
Small signal low frequency transistor models; a-c equivalent circuits, low frequency amplifier circuits; frequency effects in audio amplifiers; high frequency transistor model; voltage regulation. *Prereq. 03.311.*

03.313 Electronics III (4 cl., 4 q.h.)
Continuation of transistor circuits; untuned amplifiers, feedback amplifiers, low frequency large signal amplifiers; field effect transistor circuits and operational amplifiers. *Prereq. 03.312.*

03.314 Pulse and Digital Circuits I (2 cl., 2 q.h.)
Study of wave shaping circuitry including clippers, clampers, slicers, rise time, and sag; review of semiconductor diodes; study of the use of the junction transistor and field-effect transistor as a switch. Emphasis is placed on the non-linear aspects of transistors including transient switching characteristics. Review of semi-conductor diodes; RL and RC networks; introduction to pulse transformers; delay lines; and pulse forming networks. Study of the application of thyristors and unijunction transistors to switching circuits. *Prereq. 03.313.*

03.315 Pulse and Digital Circuits II (2 cl., 2 q.h.)
Numbering systems; binary notation and Boolean Algebra; analysis of integrated OR, AND, NOT, NAND, and NOR circuits including characteristics of various logic families; study of details of shift register and diode matrix. *Prereq. 03.314.*

03.316 Pulse and Digital Circuits III (2 cl., 2 q.h.)
Multivibrator circuits; bistable, astable, and monostable; study of counting and timing circuits; synchronization, voltage and current time-base generators; analysis of Schmitt trigger and voltage comparator circuits. *Prereq. 03.315.*

03.317 Principles of Communication Systems I (4 cl., 4 q.h.)
Analysis of RLC tuned circuits including inductively coupled circuits; a study of class-C tuned power amplifiers; analysis of RC, LC, and quartz crystal oscillators. *Prereq. 03.313.*

03.318 Principles of Communication Systems II (4 cl., 4 q.h.)
Introduction to noise and noise-figure; discussion of Fourier analysis; basic theory of amplitude, frequency, and phase-modulated systems is presented; basic concepts of transmitter and receiver circuits are detailed; comparison of noise susceptibility of the various systems is examined. *Prereq. 03.317.*

03.319 Principles of Communication Systems III (4 cl., 4 q.h.)
Introduction to pulse communication systems; basic discussion of sampling systems quantizers, encoders, modulators, transmission paths; presentation of channel capacity and decoding systems; error detection systems are compared. *Prereq. 03.318.*

03.320 Electricity and Electronics I (2 cl., 2 q.h.) (not for electrical majors)
Introduction to circuit analysis, resistive networks, periodic excitation function, steady-state a-c circuits. *Prereq. 11.319.*

03.321 Electricity and Electronics II (2 cl., 2 q.h.)
The physical foundation of electronics; physical operation of electronic devices; single-stage electronic circuits. *Prereq. 03.320.*

03.322 Electricity and Electronics III (2 cl., 2 q.h.)
Magnetic circuits and transformers; electron-mechanical energy conversion; d-c machines; a-c machines. *Prereq. 03.321.*

03.323 Electronic Laboratory (3 lab., 2 q.h.)
Experiments dealing with laboratory equipment (meters and oscilloscopes) techniques; junction and field-effect transistor characteristics; vacuum and semiconductor diodes; power supplies including the regulated type; silicon controlled rectifiers; resistance-coupled amplifiers using transistors, including feedback methods. *Prereq. 03.312.*

03.324 Circuits Laboratory I (3 lab., 2 q.h.)
Experimentation in electronic circuit theory utilizing various measurement techniques; instrumentation verification of circuit theorems; response of circuits to steps and impulses; oscilloscope theory and applications. *Prereq. 03.306.*

03.325 Circuits Laboratory II (3 lab., 2 q.h.)
Further experimentation in electrical circuits and measurement techniques. Experiments include non-linear devices, terminal characteristics of active devices, log modulus plots, network parameters and synthesis, Fourier analysis and synthesis. *Prereq. 03.324.*

03.327 Advanced Electronic Laboratory I ($2^1/_2$ lab., 2 q.h.)
Experiments dealing with oscilloscopes, class B audio amplifier with transistors, push-pull amplifiers, drivers, and distortion measurements. Double-tuned transformers, video amplifiers, audio frequency oscillators, and square-wave testing of audio amplifiers and the study of operational amplifiers. *Prereq. 03.323, 03.313.*

03.328 Advanced Electronic Laboratory II ($2^1/_2$ lab., 2 q.h.)
Experiments dealing with modulation of a class C amplifier, the diode detector, basic timing circuits, RF and crystal oscillators, networks in FM and television equipment, pulse and counter circuits and frequency dividers, sawtooth generators, astable (free-running) multivibrators, logic gates, frequency modulation detectors. *Prereq. 03.327.*

03.329 Advanced Electronic Laboratory III ($2^1/_2$ lab., 2 q.h.)
Spectral studies of FM and PM waves, amplitude limiters; the balance modulators and single sideband generators; binary adders, registers and counters; testing of a radio receiver; television receiver demonstration; analog computers; pulse forming and delay lines; slotted lines; a series of five microwave experiments; and a series of four digital experiments. *Prereq. 03.328.*

03.331 Energy Conversion I (2 cl., 2 q.h.)
Generalized theory of electromechanical energy conversion; two-winding transformer; general torque form applied to singly and doubly-excited rotating devices. *Prereq. 03.303 and 10.323.*

03.332 Energy Conversion II (2 cl., 2 q.h.)
Induction and synchronous machines; equivalent circuit models; steady-state operating modes; applications. *Prereq. 03.331.*

03.333 Energy Conversion III (2 cl., 2 q.h.)
D-c machine; transfer functions and flow chart analysis; Laplace transform techniques applied to the analysis of dynamic operating modes of rotating machines. *Prereq. 03.332.*

03.334 Control Circuits (2 cl., 2 q.h).*
Basic control design considerations; circuit transfer functions, time and frequency response relationships, bode diagrams; general feedback applications; stability and compensating techniques as related to more complex control systems. *Prereq. 03.333.*

03.335 Control Circuits II (2 cl., 2 q.h.)*
Characteristics and construction of common control circuit devices; synchros, choppers, magnetic amplifiers, SCR's, control motors, gear trains, tachometers. *Prereq. 03.334.*

03.336 Control Circuits III (2 cl., 2 q.h.)*
System open and closed loop transfer functions; stability, speed of response, and accuracy trade-offs; industrial uses including speed and voltage regulation, photoelectric, timing, sorting, and temperature control applications. *Prereq. 03.335.*

03.337 Basic Power Systems I (4 cl., 4 q.h.)
Consideration of power transmission lines; line constants; current, voltage, and power relations; introduction to electric-power distribution loads, feeders, and substations; application of matrices. *Prereq. 03.304.*

03.338 Basic Power Systems II (4 cl., 4 q.h.)
Consideration of symmetrical and unsymmetrical faults; protective devices—application and coordination; power flow in electric circuits; steady-state power limitations of systems; voltage regulation theory and application. *Prereq. 03.337.*

03.339 Basic Power Systems III (4 cl., 4 q.h.)
Computer applications to power systems with emphasis on load-flow studies; basic ideas of system planning, short-circuit studies and system stability. *Prereq. 03.338.*

03.341 Power and Controls Laboratory I ($2\frac{1}{2}$ lab., 2 q.h.)*
Experimentation on measurement techniques; basic devices and circuits (including power circuits); transformers. *Prereq. 03.333 and 03.334 or concurrently.*

03.342 Power and Controls Laboratory II ($2\frac{1}{2}$ lab., 2 q.h.)**
Experimentation on the steady-state and dynamic characteristics of rotating machines. *Prereq. 03.341.*

03.343 Power and Controls Laboratory III ($2\frac{1}{2}$ lab., 2 q.h.)**
Experimentation on control devices systems including transient and steady-state responses, voltage and speed control systems, polyphase power rectifiers. *Prereq. 03.342.*

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*03.334, 335, 336 Control Circuits I, II, III may not be offered during the 1975-76 year.
**03.341, 342, 343 Power and Controls Laboratory may not be offered during the 1975-76 year.

03.344 Fundamental Electricity and Residential Power Circuits (2 cl., 2 q.h.)
The fundamentals of electrical work, terminology, basic principles and the theory behind general practice in accordance with the National Electric Code are presented with an analysis of the actual wiring of residential buildings and farms. Wiring analysis of non-residential buildings such as churches, schools, stores, etc. for below 600 volts service is also included. *Prereq. 10.329, 11.306.*

03.345 Industrial Power Circuits (2 cl., 2 q.h.)
A survey of the use of sound engineering principles in the design of electric distribution systems which are applicable to most types and sizes of industrial plants. *Prereq. 03.344.*

03.346 Electronics for Industry I (2 cl., 2 q.h.)
Two-terminal devices; diode rectifiers and filters; transistors and vacuum tubes; D. C. biasing. *Prereq. 03.302.*

03.347 Electronics for Industry II (2 cl., 2 q.h.)
Small signal analysis; field effect transistors; multi-stage systems; decibel and frequency considerations; large signal amplifiers. *Prereq. 03.346.*

03.348 Electronics for Industry III (2 cl., 2 q.h.)
PNPN and other devices; differential and operational amplifiers; regulators and miscellaneous circuit applications; cathode ray oscilloscope. *Prereq. 03.347.*

03.349 Advanced Electronic Laboratory IV ($2^1/_2$ lab., 2 q.h.)
Electronic Engineering exercises selected from the following topics: transistor amplifier design, operational amplifiers, analog computation, Fourier optics, acoustics, and microwaves. *Prereq. 03.329 or equivalent.*

03.350 Advanced Electronic Laboratory V ($2^1/_2$ lab., 2 q.h.)
Design projects laboratory. Students will be directed in design of such projects as motor speed control, DC-DC converter, high current pulse amplifiers, etc. *Prereq. 03.349.*

***03.351 Bioelectronic Devices I** (2 cl., 2 q.h.)
Transducers, relating body functions and biomedical reactions to electronic signals; optics and optical components including mirror lenses, prisms, and gratings; defraction and refraction of light into spectral components and spectra. *Prereq. 03.312.*

***03.352 Bioelectronic Devices II** (2 cl., 2 q.h.)
Operational amplifier design and utilization, special power supply design; chromatography and design of chromatography systems; spectrophotometry radiation counting equipment and Ph measurement equipment related to chromatography; the electrocardiograph, electroencephalograph, and related physiological equipment will be discussed. *Prereq. 03.351.*

***03.353 Bioelectronic Devices III** (2 cl., 2 q.h.)
Blood pressure and flow measurement including ultrasonic devices, centrifugation, and ultracentrifugation equipment as well as amino acid analyzers; nerve-conduction apparatus and techniques. Professional specialists in the field will lecture on special topics. *Prereq. 03.352.*

*Bioelectronic Devices (03.351, 03.352, 03.353) and the laboratory sequence (03.357, 03.358, 03.359) are offered every other year.

***03.357 Bioelectronic Laboratory I** ($2^1/_2$ lab., 2 q.h.)
Experiments dealing with oscilloscopes, transistor amplifiers with negative feedback, directly coupled and difference amplifiers, clamping circuits, transients, logic circuits. Experiments in electronic circuitry including audio amplifiers, oscillators, and related circuits. *Prereq. 03.312.*

***03.358 Bioelectronic Laboratory II** ($2^1/_2$ lab., 2 q.h.)
Experiments in optics covering lenses, mirrors, prisms, gratings, and spectra. Radiation experiments. Special design experiments on the optical bench related to spectrophotometry. Experiments with optical and electroptical system. Design of detection and amplification monitoring systems. *Prereq. 03.357.*

***03.359 Bioelectronic Laboratory III** ($2^1/_2$ lab., 2 q.h.)
Experiments and open discussion centered around bioelectronic systems including electrocardiogram, electroencephalograph, amino acid analyzers, Ph measurement and titration apparatus, centrifuges, and ultracentrifuges, as well as radioactive sample changers. *Prereq. 03.358.*

03.360 Introduction to Radar Systems (4 cl., 4 q.h.)
Discussion of radar range equation; examination of CW, FM, MTI, Pulse-Doppler and monopulse systems; description of transmitter, antennas, and receivers; and a discussion of information extraction from typical radar waveforms. *Prereq. 03.316 and 03.319.*

03.361 Transients in Linear Systems I (2 cl., 2 q.h.)
Application of differential equations to the solutions of linear, time-invariant electrical networks; introduction to singularity functions, convolution, and time domain transient analysis. *Prereq. 10.324 or concurrently, 03.304 or equivalent.*

03.362 Transients in Linear Systems II (2 cl., 2 q.h.)
Network topology and duality; introduction to the methods of transformation calculus and complex frequency concepts; signal analysis in the frequency domain; Fourier series; Fourier and Laplace transform methods. *Prereq. 10.325 or concurrently, 03.361.*

03.363 Transients in Linear Systems III (2 cl., 2 q.h.)
A varied selection of circuit problems are solved using Laplace transforms and related theorems. *Prereq. 03.362.*

03.364 Advanced Circuit Theory I (2 cl., 2 q.h.)
Definitions and tests are lumped, linear, time-invariant systems; review of matrix algebra; general analysis of networks by loop current and node voltage variables using matrix techniques. *Prereq. 03.363.*

03.365 Advanced Circuit Theory II (2 cl., 2 q.h.)
A study of two-port networks using various parameter systems; S-plane analysis of system response; general filter analysis. *Prereq. 03.364.*

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*Bioelectronic Devices (03.351, 03.352, 03.353) and the laboratory sequence (03.357, 03.358, 03.359) are offered every other year.

03.366 Advanced Circuit Theory III (2 cl., 2 q.h.)
Discussion of the necessary and sufficient conditions for the physical realization of impedance functions; Forster and Cauer forms; synthesis of filters. *Prereq. 03.365.*

03.367 Advanced Pulse and Digital Circuits I (2 cl., 2 q.h.)
Linear and non-linear pulse forming and processing techniques; design of gate and binary circuits for operation under severe environmental conditions. *Prereq. 03.363.*

03.368 Advanced Pulse and Digital Circuits II (2 cl., 2 q.h.)
Analysis of applications of existing integrated circuits. *Prereq. 03.367.*

03.369 Advanced Pulse and Digital Circuits III (2 cl., 2 q.h.)
Negative-impedance devices and their applications; linear voltage and current sweep circuits. *Prereq. 03.368.*

03.371 Analog, Digital, and Hybrid Computers I (2 cl., 2 q.h.)
Theory and operation of analog computers; amplitude scaling and time scaling on the analog computer, and application of the analog computer to the solution of linear and non-linear differential equations. *Prereq. 10.325 and 03.303.*

03.372 Analog, Digital, and Hybrid Computers II (2 cl., 2 q.h.)
Introduction to the field of digital computer design. Topics include general computer organization, number systems and number representations, design characteristics of major computer units. Boolean Algebra application to computer design. *Prereq. 03.371.*

03.373 Analog, Digital, and Hybrid Computers III (2 cl., 2 q.h.)
Survey of the present state-of-the-art hybrid computers. Problem areas unique to hybrid computers such as interface, analog-to-digital, and digital-to-analog conversion will also be discussed. Hybrid computer programming techniques. Direct digital process control computers. *Prereq. 03.372.*

03.374 Digital Systems I (2 cl., 2 q.h.)
Basic concepts of Boolean Algebra; switching components; review of number systems, codes, and negative number representation; analysis and synthesis of combinational circuits; examples of application. *Prereq. 03.316.*

03.375 Digital Systems II (2 cl., 2 q.h.)
Data acquisition techniques; analysis and synthesis of sequential circuits; examples of applications; analog and digital data reduction; real time data processing. *Prereq. 03.374.*

03.376 Digital Systems III (2 cl., 2 q.h.)
Residue number systems; threshold logic concepts; advanced digital system techniques with application to complex systems; data decommutation techniques relative to communications systems; aerospace telemetry systems. *Prereq. 03.375.*

03.377 Control Systems I (2 cl., 2 q.h.)
Analysis of linear servomechanisms under both transient and steady-state conditions; signal flow graphs. *Prereq. 03.363.*

03.378 Control Systems II (2 cl., 2 q.h.)
Laplace transforms used in the formulation of block diagrams and transfer functions; system stability; root locus techniques. *Prereq. 03.377.*

03.379 Control Systems III (2 cl., 2 q.h.)
Treatment of Nyquist criteria, and Bode diagram methods for systems evaluation. *Prereq. 03.378.*

03.381 Linear Active Circuit Design I (2 cl., 2 q.h.)
Review of large and small signal analysis for bipolar, unipolar, and integrated circuit devices; review of feedback principles as applied to discrete, hybrid, and integrated circuit amplifiers or regulators; signal flow graph analysis will be used to determine accuracy and sensitivity of feedback loops. *Prereq. 03.313.*

03.382 Linear Active Circuit Design II (2 cl., 2 q.h.)
Factors influencing high and low frequency response, and slew rate of both discrete and integrated circuit amplifiers; bode and gain-phase plots will be used to analyze stability of feedback loops. *Prereq. 03.381.*

03.383 Linear Active Circuit Design III (2 cl., 2 q.h.)
Active filter and oscillator design using both discrete and hybrid/integrated circuits; principles of low-noise video amplifiers; design of linear integrated electronic systems. *Prereq. 03.382.*

03.384 Microwave Semiconductor Devices and Circuits I (2 cl., 2 q.h.)
Provides basic understanding of the principles and design techniques for microwave circuits utilizing semiconductor devices; introduction to microwave theory and techniques; development of the Smith Chart for the graphical solution of microwave problems. *Prereq. 03.304.*

03.385 Microwave Semiconductor Devices and Circuits II (2 cl., 2 q.h.)
Introduction to the basic properties of semiconductors at microwave frequencies including analysis of bulk semiconductor effects and of junction phenomena. The course will analyze the physical properties and microwave characteristics of avalanche diodes, varactor diodes, tunnel diodes, PIN diodes, Gunn effect devices, and the microwave transistors. *Prereq. 03.384.*

03.386 Microwave Semiconductor Devices and Circuits III (2 cl., 2 q.h.)
Design and utilization of semiconductor devices in microwave circuits for microwave generation, amplification, frequency conversion, multiplication, and detection; introduction to the miniaturization of microwave circuits and the integration of microwave functions; the characteristics and limitations of the devices. *Prereq. 03.385.*

03.387 Integrated Circuits I (2 cl., 2 q.h.)
Linear integrated circuits; operational amplifiers-characteristics; selection cri-

teria; linear and nonlinear circuit applications; D/A and A/D converters. *Prereq. 03.313.*

03.388 Integrated Circuits II (2 cl., 2 q.h.)
Digital building blocks; truth tables and synthesis of digital logic; flip-flops and timing circuits; logic families and specifications; arithmetic operations. *Prereq. 03.387.*

03.389 Integrated Circuits III (2 cl., 2 q.h.)
Arithmetic operations concluded; counters; registors and decoding; memories-magnetic; TTL and MOS; theory applied to calculators; digital phase lock loops. *Prereq. 03.388.*

03.391 Computer Technology Laboratory II (2½ lab., 2 q.h.)
Logic performing circuits; flip-flops; binary-counters; sampling gates; pulse and counter circuits and frequency dividers; a study of an analog computer. *Prereq. 03.327.*

03.392 Computer Technology Laboratory III (2½ lab., 2 q.h.)
A continuation of 03.391 topics plus the use of a PDP 8-1 minicomputer. *Prereq. 03.391.*

03.396 Basic Optics for Instrumentation (2 cl., 2 q.h.)
Provides the necessary background for the two instrumentation courses listed below. Includes basic topics in geometrical and physical optics. No previous background in optics is assumed. Topics included are: Gaussian optics, fundamental laws of image formation, basic elements of optical design, scalar wave theory, interference and diffraction, polarization, basics of coherent (laser) and non-coherent optics. *Prereq. 10.308.*

03.397 Optical Instrumentation I (2 cl., 2 q.h.)
Treats the classical image-forming instruments (telescopes, microscopes, etc.) as components of optical systems. Includes magnification, aberrations, resolution criteria, photometry, compatibility of system components and optimization of systems. Topics in coherent imaging such as phase contrast and holography. *Prereq. 03.396.*

03.398 Optical Instrumentation II (2 cl., 2 q.h.)
The basic non-image forming systems used for analysis control and metrology. Includes spectroscopy, interferometry (classical and holographic), electron-ion optical, and X-ray systems. *Prereq. 03.397.*

03.399 Fundamentals of Operational Amplifiers (2 cl., 2 q.h.)
Emphasis on treating the amplifier as a black box. Covers gain, distortion, feedback, matching, offset, drift, and frequency response. A section on practical applications. *Prereq.* 03.312.

03.401 Electric Devices and Systems I (2 cl., 2 q.h.)
(See General Interest Courses, pages 162-163.)

03.402 Electric Devices and Systems II (2 cl., 4 q.h.)
(See General Interest Courses, pages 162-163.)

03.410 Electrical Measurements (4 cl., 4 q.h.) (Day Curriculum)
Measurement of voltage, current, power, resistance, capacitance, inductance, impedance, frequency, etc.; direct and substitution measurements; evaluation of measured data—standard deviation and tolerance limits, instruments calibrations—effects of residual impedance. *Prereq. 03.454.*

03.420 Electricity and Electronics I (4 cl., 4 q.h.) (Day Curriculum)
Introduction to circuit analysis, resistive networks, periodic excitation function, steady state a-c circuits; the physical foundations of electronics and the physical operation of electronic devices. *Prereq. 11.319.*

03.421 Electricity and Electronics II (4 cl., 4 q.h.) (Day Curriculum)
Single-stage electronic circuits, magnetic circuits and transformers, electro mechanical energy conversion, d-c machines, a-c machines. *Prereq. 03.420.*

03.440 Physical Electronics (4 cl., 4 q.h.) (Day Curriculum)
Electron Ballistics and applications; properties of atoms and electrons as related to conduction of electricity in solids; fundamentals of semiconductors, crystal diodes, and transistors; theory of field-effect transistors, integrated circuits, and photoelectric devices. *Prereq. 11.420.*

03.430 Energy Conversion (4 cl., 4 q.h.) (Day Curriculum)
Generalized theory of rotating energy conversion devices; steady-state operation of the multiply-excited direct-current machine; control of speed; special machines; transformers; steady-state considerations of induction and synchronous machines; generalized machine and circuit model; Laplace transform techniques applied to the analysis of dynamic operating modes of rotating machines. *Prereq. 03.452 and 10.422.*

03.437 Distributed Systems (4 cl., 4 q.h.) (Day Curriculum)
Radiation, transmission, and reception of electromagnetic waves; distributed-line constants and traveling waves of transmission lines; differential equations of the uniform line. *Prereq. 10.422.*

03.451 Circuit Analysis I (4 cl., 4 q.h.) (Day Curriculum)
Ohm's law, Kirchoff's current and voltage laws, equivalent resistances and sources, mesh and modal analysis, network theorems, two-port networks and power relations—all with respect to direct currents; energy storage, singularity functions, response of R, L, and C elements to singularities. *Prereq. 10.320, 11.319.*

03.452 Circuit Analysis II (4 cl., 4 q.h.) (Day Curriculum)
Complex algebra, phasors, frequency domain, mutual inductance, transformers, steady-state a-c theory, driving point and transfer impedances, power and energy in a-c circuits; Laplace transforms; partial fraction expansion; Laplace transform techniques applied to the solution of RLC networks. *Prereq. 03.451.*

03.453 Circuits Analysis III (4 cl., 4 q.h.) (Day Curriculum)
Application of differential equations to the solutions of linear, time-invarient electrical networks; introduction to singularity functions, convolution, and time domain transient analysis; network topology and duality; introduction to the

methods of transformation calculus and complex frequency concepts. *Prereq. 03.542.*

03.454 Circuits Analysis IV (4 cl., 4 q.h.) (Day Curriculum)
Signal analysis in the frequency domain; Fourier series; Fourier and Laplace transform methods; a varied selection of circuit problems are solved using Laplace transforms and related theorems. *Prereq. 03.453.*

03.460 Engineering Analysis I (4 cl., 4 q.h.) (Day Curriculum)
Linear algebra and its application to circuit equations; solution of linear differential equations including an introduction to Laplace transforms. *Prereq. 10.422 and 03.452.*

03.461 Engineering Analysis II (4 cl., 4 q.h.) (Day Curriculum)
Complex variables and their relevance to an electrical engineering program. *Prereq. 10.422.*

03.470 Digital Computers (4 cl., 4 q.h.) (Day Curriculum)
Introduction to the field of digital computer design. Topics include general computer organization, number systems and number representations, design characteristics of major computer units, Boolean Algebra applications to computer design. *Prereq. 03.313 or concurrently.*

03.477 Control Engineering I (4 cl., 4 q.h.) (Day Curriculum)
Analysis of linear servomechanisms under both transient and steady-state conditions; signal flow graphs; Laplace transforms used in the formulation of block diagrams and transfer function. *Prereq. 03.454 and 10.422.*

03.478 Control Engineering II (4 cl., 4 q.h.) (Day Curriculum)
System stability; root locus techniques; treatment of Nyquist criteria and Bode diagram methods for systems evaluation. *Prereq. 03.477.*

03.490 Optical Instrumentation (4 cl., 4 q.h.) (Day Curriculum)
Telescopes, microscopes, etc., as optical system components. Includes magnification, aberrations, resolution criteria, photometry. Compatibility of system components and optimization of systems. The basic non-image forming systems used for analysis control and metrology. *Prereq. 10.308 and 11.319.*

CHEMICAL ENGINEERING TECHNOLOGY

04.381 Nuclear Technology I (2 cl., 2 q.h.)
Atomic and nuclear structure; discovery and nature of radioactivity; nuclear instrumentation for particle detection, monitoring, and experimentation; supplementary laboratory experiments. *Prereq. 10.323 and 11.319.*

04.382 Nuclear Technology II (2 cl., 2 q.h.)
Nuclear reactions and energy; induced nuclear transformations; neutron properties; radiological safety—the hazards, problems, and protection; applications of radionuclides; supplementary laboratory experiments. *Prereq. 04.381.*

04.383 Nuclear Technology III (2 cl., 2 q.h.)
The fission process and its applications; nuclear reactors—their classification, design and application; nuclear fuel processing; radioactive waste disposal; supplementary laboratory experiments. *Prereq. 04.382.*

04.481 Nuclear Technology (4 cl., 4 q.h.) (Day Curriculum)
Atomic and nuclear structure; discovery and nature of radioactivity; nuclear reactions and energy; induced nuclear transformations; neutron properties; nuclear instrumentation for particle detection, monitoring, and experimentation; the fission process and its applications; nuclear reactors—their classification, design, and application; supplementary laboratory experiments. *Prereq. 10.422 and 11.319.*

ENGINEERING GRAPHICS AND COMPUTATION

09.307 Electrical and Electronic Graphics I (2 cl., 2 q.h.)
Instrument techniques; principles of projection, drawing, reading, and interpretation of multiview drawings; isometric, oblique, pictorial representations; auxiliary views and sections. *Prereq. none.*

09.308 Electrical and Electronic Graphics II (2 cl., 2 q.h.)
Introduction to electronic graphics, including symbols, schematics, block and logic diagrams, production and cable drawings, military standards. *Prereq. 09.307.*

09.309 Electrical and Electronic Graphics III (2 cl., 2 q.h.)
A study of single- and double-sided printed circuit layout, integrated circuits, electro-mechanical designs, wiring, and interconnection diagrams; graphical data presentation. *Prereq. 09.308.*

09.311 Engineering Graphics I (2 cl., 2 q.h.)
Introduction to engineering drawing, geometric construction, charts and graphs, orthographic projection through auxiliary views. *Prereq. none.*

09.312 Engineering Graphics II (2 cl., 2 q.h.)
Detail drawing, including intersections and development; reading of multiview drawings; pictorial representation. *Prereq. 09.311.*

09.313 Engineering Graphics III (2 cl., 2 q.h.)
Manufacturing processes and dimensioning; topographical; earth work; drawing analysis of assemblies; case studies in engineering design. *Prereq. 09.312.*

09.314 Engineering Design I (Kinematics) (1 cl., 2 lab., 2 q.h.)
Translatory and rotary motion involving basic mechanisms through graphical vector and mathematical analysis of displacement, velocity, and acceleration; some redesign of existing mechanisms; simple, compound, reverted, and epicyclic gear trains. *Prereq. 09.313, 11.317.*

09.315 Engineering Design II (1 cl., 2 lab., 2 q.h.)
Drawings and specifications for the production and precision machining of castings, forging, weldments, etc.; discussion of design components. *Prereq. 09.314.*

09.316 Engineering Design III (1 cl., 2 lab., 2 q.h.)
Introduction to design through graphical analysis of cam and follower motions and other mechanisms; creativity and design processes through case studies and original projects requiring oral presentation of student's involvement in both synthesis and innovative activities. *Prereq. 09.315.*

09.351 Principles of Computer Programming I (2 cl., 2 q.h.)*
Rules for forming simple FORTRAN programs. Students write and run programs to compute Fibonacci sequences, averages, kinematic displacements, and maxima and minima in both discrete and continuous cases; batch programming in FORTRAN IV; introduction to computer organization and machine language. *Prereq. 10.308.*

09.352 Principles of Computer Programming II (2 cl., 2 q.h.)*
Extended capabilities of the FORTRAN language, including DO loops, subscripted variables, and alphanumeric arrays. Students write and run application programs for printer plotting, sorting, matrix algebra, and approximations. Batch programming in FORTRAN IV. *Prereq. 09.351.*

09.353 Principles of Computer Programming III (2 cl., 2 q.h.)*
Subroutine and function subprograms; use of Scientific Subroutine Package with programming applications in probability, solution of simultaneous linear equations, root finding and quadrature; introduction to use of plotter; batch programming in FORTRAN IV. *Prereq. 09.352.*

09.354 Computer Systems I (Advanced Fortran Techniques) (2 cl., 2 q.h.)
Data storage and retrieval techniques in Fortran; tapes, discs, drums, and methods for computer files; hierarchical data and file structures; file manipulation and access methods. *Prereq. 09.353.*

09.355 Computer Systems II (Symbolic Programming Language) (2 cl., 2 q.h.)
Internal data representation and manipulation; computer instructions language; symbolic languages and assemblers. *Prereq. 09.354.*

09.356 Computer Systems III (Operating Systems) (2 cl., 2 q.h.)
Batch processing; time sharing; mixed systems; and multiprogramming; Northeastern University's operating system-MASTER.

09.357 Computer Aided Design I (Computer Graphics) (2 cl., 2 q.h.)
Computer graphics programming, using the computer to draw two- and three-dimensional shapes; character generation and manipulation methods; Implementation on Northeastern's calcomp plotter. *Prereq. 09.353.*

09.358 Computer Aided Design II (Problem Oriented Languages) (2 cl., 2 q.h.)
Discussion of popular languages; user oriented requirements; input algorithms; command structure; design of a POL system. *Prereq. 09.353.*

*NOTE Students at suburban campuses will find it necessary periodically to come to the Boston Campus Computation Center to run their homework problems.

09.359 Computer Aided Design III (Simulation and Mathematical Models) (2 cl., 2 q.h.)
Random numbers programs to predict the outcome of probabilistic systems; Computer models of deterministic systems. *Prereq. 09.353.*

09.361 Computer Controlled Systems I (2 cl., 2 q.h.)
Introduction to minicomputers; minicomputers organization and logical components; basic machine language programming. *Prereq. 09.353.*

09.362 Computer Controlled Systems II (2 cl., 2 q.h.)
Extended programming of minicomputers; the use of a minicomputer as an element in process control; analysis of open and closed loop systems. *Prereq. 09.361.*

09.363 Computer Controlled Systems III (2 cl., 2 q.h.)
Specification of computer elements for a control system; design and synthesis of a computer-controlled system to meet process requirements. *Prereq. 09.362.*

09.401 Interpretation of Industrial Drawings (2 cl., 2 q.h.)
(See General Interest Courses, pages 162-163.)

09.421 Principles of Computer Programming I (2 cl., 2 q.h.) (Day Curriculum)
Rules for forming simple FORTRAN programs; basic input/output techniques; FORMAT control; algorithms for solving simple scientific problems; computing large sums; maxima and minima in both discrete and continuous cases. *Prereq. 10.308 or concurrently.*

09.422 Principles of Computer Programming II (2 cl., 2 q.h.) (Day Curriculum)
Extended capabilities of the FORTRAN language; manipulation of vectors and arrays; subroutine and function subprogramming; continued applications of computers, sorting, merging, root determination; A-Format. *Prereq. 09.421.*

09.423 Principles of Computer Programming III (2 cl., 2 q.h.) (Day Curriculum)
Use of scientific subroutines, simulation, random numbers; introduction to numerical methods (solution of simultaneous equations, quadrature, derivatives); use of plotter language; display of information. *Prereq. 09.422.*

09.461 Engineering Design Graphics I (2 cl., 2 q.h.) (Day Curriculum)
Introduction to engineering drawing; orthographic projection and primary auxiliary views; reading and interpreting of multiview drawings; isometric and oblique pictorial representation. *Prereq. none.*

09.462 Engineering Design Graphics II (2 cl., 2 q.h.) (Day Curriculum)
Emphasis on engineering drawings required to support engineering design, including standard conventions, dimensioning, and basic production processes; shop detail drawings are covered; exercise in design processes is given through selected projects and case studies. *Prereg. 09.461.*

09.463 Engineering Design Graphics III (2 cl., 2 q.h.) (Day Curriculum)
Greater involvement in design by examination of many commonly used components; case studies of large systems discussed in class; advanced design projects assigned. *Prereq. 09.462.*

09.464 Engineering Design Graphics IV (4 cl., 4 q.h.) (Day Curriculum)
Graphical analysis of kinematic elements; displacement, locus generators, velocity vectors, and sliding motion; simple, compound, and reverted gear trains; acceleration analysis of mechanisms such as cams and linkages; functions, scales and nomographs; introduction to self-correcting (feedback) systems. *Prereq. 09.463.*

MATHEMATICS

10.301 Introduction to Mathematics I (4 cl., non-credit)
A comprehensive review of high school algebra including first-degree equations, factoring, fractions, fractional equations, ratio and proportion, word problems, and concepts of plane geometry. *Prereq. none.*

10.302 Introduction to Mathematics II (4 cl., non-credit)
Algebraic operations with complex fractions, mixed expressions, square roots, radicals, quadratic equations; simultaneous equations, graphs and fractional zero and negative exponents; the geometry of the right triangle, areas of polygons, circles, and loci problems; basic slide rule operation. *Prereq. 10.301.*

10.303 Introduction to Mathematics (Day Curriculum)
An accelerated combination of 10.301 and 10.302.

10.307 College Algebra and Trigonometry I (4 cl., 4 q.h.)
Fundamental algebraic operations; complex numbers; radicals and exponents; functions; linear and quadratic equations; irrational equations; inequalities; variation; roots of polynomial equations. *Prereq. Math. Placement Test or 10.302.*

10.308 College Algebra and Trigonometry II (4 cl., 4 q.h.)
Logarithms; trigonometric functions of angles in degrees and radians; trigonometric identities and equations; right triangles; oblique triangles; complex numbers in trigonometric form; systems of equations; determinants. *Prereq. 10.307.*

10.316 Probability and Statistics I (2 cl., 2 q.h.)
Basic tools, e.g., sets, permutations, and combinations; probability and applications. *Prereq. 10.308, or 10.329 or 10.335.*

10.317 Probability and Statistics II (2 cl., 2 q.h.)
Descriptive statistics; frequency distributions and probability density functions; normal and other distributions. *Prereq. 10.316.*

10.318 Probability and Statistics III (2 cl., 2 q.h.)
Bivariate distributions; correlation; statistical inference and estimation; regression. *Prereq. 10.317.*

10.320 Calculus I (4 cl., 4 q.h.)
Plane Analytic Geometry; differentiation of algebraic functions; rate, motion, maximum and minimum problems; derivatives of higher order; curve sketching; basics in functions, limits, and continuity. *Prereq. 10.308 or 10.329.*

10.321 Calculus II (2 cl., 2 q.h.)
Integration of algebraic functions; integration and differentiation of logarithmic, exponential, and trigonometric terms; calculations of areas, volumes, and length of arc by definite integrals. *Prereq. 10.320.*

10.322 Calculus III (2 cl., 2 q.h.)
Differentiation and integration of inverse trigonometric functions; integration by parts, substitution, and tables; the Trapezoidal and Simpson Rules; the application of the differential and integral calculus to the Polar Coordinate System; indeterminate forms. *Prereq. 10.321.*

10.323 Calculus IV (2 cl., 2 q.h.)
Vectors in the plane; vectors in three-dimensional space; functions of more than one variable; partial differentiation; multiple integration; infinite series; Taylor's and Maclaurin's Formula. *Prereq. 10.322.*

10.324 Differential Equations I (2 cl., 2 q.h.)
Vector analysis; matrices and linear algebra. *Prereq. 10.323.*

10.325 Differential Equations II (2 cl., 2 q.h.)
Ordinary differential equations—standard types of the first order; linear differential equations, especially with constant coefficients; variation of parameters. *Prereq. 10.324.*

10.326 Differential Equations III (2 cl., 2 q.h.)
Series solutions of differential equations; Laplace transforms; Fourier series; and orthogonal functions. *Prereq. 10.325.*

10.327 Mathematics I (2 cl., 2 q.h.)
Methods and applications of algebra; graphical techniques. *Prereq. Math. Placement Test, 10.331, or 10.302.*

10.328 Mathematics II (2 cl., 2 q.h.)
Linear and quadratic equations; exponents and radicals; variation. *Prereq. 10.327.*

10.329 Mathematics III (2 cl., 2 q.h.)
Introductory topics of probability and statistics; logarithms and applications; mathematics of finance. *Prereq. 10.328.*

10.330 Basic Mathematics I (2 cl., non-credit)
A review of elementary algebra; algebraic expressions and operations, equations, word problems. *Prereq. none.*

10.331 Basic Mathematics II (2 cl., non-credit)
Further review; operations with polynominals, factoring, fractional expressions, word problems. *Prereq. 10.330.*

10.332 Mathematics for Business Management I (2 cl., 2 q.h.)
Topics of mathematics applicable to business management; logic, set theory, probability and its uses in decision-making under uncertainty. *Prereq. 10.329 or equiv.*

10.333 Mathematics for Business Management II (2 cl., 2 q.h.)
Statistical methods; mathematics of finance; introduction to vector and matrix algebra. *Prereq. 10.332 or equiv.*

10.334 Mathematics for Business Management III (2 cl., 2 q.h.)
Linear programming and optimization techniques; applications of matrix algebra; game theory. *Prereq. 10.33 or equiv.*

10.351 Advanced Mathematics I (Numerical Analysis) (2 cl., 2 q.h.)
Basic methods of numerical analysis—roots by iteration; approximating polynomials and interpolation; least squares fitting; numerical integration; approximate solution of ordinary differential equations—problems employing the electronic computer. *Prereq. 09.353 and 10.326.*

10.352 Advanced Mathematics II (2 cl., 2 q.h.)
Introduction to partial differential equations, boundary-value problems, Sturm-Liouville systems. *Prereq. 10.351.*

10.353 Advanced Mathematics III (2 cl., 2 q.h.)
Special topics in analysis. *Prereq. 10.352.*

10.361 Modern Algebra I (2 cl., 2 q.h.)
Sets; binary operations; mappings; rings, integers, fields; rationals; reals, bases for computer applications; Euclidean algorithm; primes. *Prereq. 10.308, 10.329 or 10.335.*

10.362 Modern Algebra II (2 cl., 2 q.h.)
Field of complex number; groups; subgroups; polynomial rings; homomorphisms; isomorphisms; ideals. *Prereq. 10.361.*

10.363 Modern Algebra III (2 cl., 2 q.h.)
Vector spaces; linear transformations; dependence, independence; dimension applications to engineering, science, and business. *Prereq. 10.362.*

10.364 Modern Applied Algebra (4 cl., 4 q.h.)
Introduction to the language of abstract algebra to the following topics: graphs, finite state machines, programming languages, Boolean Algebra, lattices, coding for communication channels, and radar; look at algebraic theory of linear systems. *Prereq. 10.361, 10.362 and 10.363.*

10.401 Foundations of Mathematics I (2 cl., 2 q.h.)
(See General Interest Courses, pages 162-163.)

10.402 Foundations of Mathematics II (2 cl., 2 q.h.)
(See General Interest Courses, pages 162-163.)

10.403 Foundations of Mathematics III (2 cl., 2 q.h.)
(See General Interest Courses, pages 162-163.)

10.421 Calculus—A (4 cl., 4 q.h.) (Day Curriculum)
Applications of derivatives to curve-sketching; antidifferentiation; the definite in-

tegral, with applications; calculus of non-algebraic functions—logarithmic, exponential, and trigonometric; calculus of inverse trigonometric functions; techniques of integration; polar coordinates; the conic sections; vectors in a plane; indeterminate forms; L'Hospital's rule. *Prereq. 10.320.*

10.422 Calculus—B (3 cl., 4 q.h.) (Day Curriculum)
Calculus of functions of several variables; partial differentiation; multiple integrals; infinite series; vector analysis; matrices; and linear algebra. *Prereq. 10.421.*

10.423 Differential Equations (4 cl., 4 q.h.) (Day Curriculum)
Ordinary differential equations—standard types of the first order; linear differential equations, especially with constant coefficients; Laplace transforms; series solutions of differential equations; Fourier series; and orthogonal functions. *Prereq. 10.422.*

PHYSICS

*Courses marked * not available in every curriculum. See curricula in Programs of Instruction section for applicable sequence, pp. 67-106.*

11.301 Introductory Physics I (4 cl., non-credit)
A survey of physical principles and theories related to field of mechanics. Emphasis is placed upon the solution of applied problems. *Prereq. none.*

11.302 Introductory Physics II (4 cl., non-credit)
Extension of principles in mechanics and introduction of concepts in heat, sound, light, electricity, and magnetism. *Prereq. 11.301.*

***11.304 General Physics I** (2 cl., 2 q.h.)
Survey of Newtonian mechanics; kinematics and dynamics of particle motion; projectile and circular motion; rotational motion; conservation laws of energy and momentum. *Prereq. 10.327 or concurrently.*

***11.305 General Physics II** (2 cl., 2 q.h.)
Temperature; heat energy; mechanical equivalent of heat; wave motion; sound; Doppler's effect; properties of light; simple optical systems. *Prereq. 11.304.*

***11.306 General Physics III** (2 cl., 2 q.h.)
Fundamentals of electricity and magnetism; fields; potential; electric current; inductance; capacitance; electromagnetism; a-c and d-c series circuits. *Prereq. 11.305.*

11.317 Physics I (Mechanics) (4 cl., 4 q.h.)
Kinematics and dynamics of particle motion; Newton's laws; projectile and circular motion; conservation laws for momentum and energy; rational motion; simple harmonic motion. *Prereq. 10.307 or concurrently.*

11.318 Physics II (Wave Motion, Sound, Heat) (4 cl., 4 q.h.)
Wave motion; intensity; interference phenomena; Doppler effect; vibrating sys-

tems; temperature; heat; change of state; heat transfer; kinetic theory of gases; general gas laws; thermodynamics. *Prereq. 11.317.*

11.319 Physics III (Electricity, Magnetism, Light) (4 cl., 4 q.h.)
Electrostatics; magnetism; magnetic induction; induced currents; direct and alternating current circuits; properties of light; reflection; refraction; dispersion; optical systems; diffraction; polarization. *Prereq. 11.318.*

11.320 Semiconductor Physics & Devices (4 cl., 4 q.h.)
Properties of atoms and electrons as related to conduction of electricity in solids; energy-band of semiconductors; Nature of ph junctions; diode equation; electron and holes; junction, light-emitting, and tunnel diodes; diode rectifiers; junction and field-effect transistors; integrated circuits. (This is a combination of 11.322 and 11.323.) *Prereq. 11.316 or 11.319.*

11.321 Wave Phenomena (2 cl., 2 q.h.)
Application of fundamental principles of waves to electromagnetic radiation; waves on transmission lines; selected topics in antennas and wave guides. *Prereq. 11.319 or 11.316.*

11.322 Semiconductor Physics I (2 cl., 2 q.h.)
Properties of atoms and electrons as related to conduction of electricity in solids; energy-band of semiconductors; nature of ph junctions; diode equation; electron and holes.

11.323 Semiconductor Devices II (2 cl., 2 q.h.)
Junction, light-emitting, and tunnel diodes; diode rectifiers; junction and field-effect transistors; integrated circuits.

11.324 Introductory Survey of Lasers (2 cl., 2 q.h.)
Physical principles and technology will be emphasized. Course will include a review of the fundamental concepts of light and spectroscopy, the basic theory of lasers, studies of solid state; atomic, ionic and molecular gas; organic dye; and semiconductor lasers. Related optics and detection will be discussed. *Prereq. 11.319.*

11.331 Modern Physics I (2, cl. 2 q.h.)
Introduction to theory of relativity; particle properties of waves; wave properties of particles; atomic structure; Bohr model of the atom. *Prereq. 11.306 or 11.319.*

11.332 Modern Physics II (2 cl., 2 q.h.)
Quantum mechanics; electron spin; atomic spectra; complex atoms; solid state physics; lasers. *Prereq. 11.331.*

11.333 Modern Physics III (2 cl., 2 q.h.)
Atomic nucleus; radioactive decay; thermonuclear energy; nuclear reactions; elementary particles. *Prereq. 11.332.*

11.373 Physics Laboratory I ($2\frac{1}{2}$ cl., 2 q.h.)
First quarter of a two-quarter physics laboratory. Experiments in mechanics, fluid dynamics, and gas laws. *Prereq. 11.305 or 11.318, or concurrently.*

11.374 Physics Laboratory II (2½ cl., 2 q.h.)
A continuation of 11.373. Experiments in wave motion, optics, and electrical circuits.

11.401 Man's Physical Environment I (2 cl., 2 q.h.)
(See General Interest Courses, pages 162-163.)

11.402 Man's Physical Environment II (2 cl., 2 q.h.)
(See General Interest Courses, pages 162-163.)

11.420 Physics IV (4 cl., 4 q.h.) (Day Curriculum)
Application of fundamental principles of waves to electromagnetic radiation; waves on transmission lines; further study of wave motion topics from 11.318. *Prereq. 11.319.*

CHEMISTRY

Students wishing to elect other chemistry courses should refer to the University College Catalog and petition for approval by the Academic Standing Committee of Lincoln College.

12.501 Introductory Chemistry I (4 cl., non-credit)
A non-mathematical approach to the concepts of chemistry including matter, elements and compounds, chemical bonding, chemical equations. *Prereq. none.*

12.502 Introductory Chemistry II (4 cl., non-credit)
A continuation of 12.301, including periodic system, forms of energy, oxidation-reduction, solutions, chemical and ionic equilibrium, nuclear reactions, and a brief introduction to organic chemistry. *Prereq. 12.501 or equiv.*

12.507 Modern Chemistry I (Intro. to Inorganic Chemistry) (2 cl., 2 q.h.)
Fundamental ideas of matter and energy, chemical bonding, chemical energy, water and solutions, colloids, ionic reactions, oxidation and reduction, acidity, radioactivity, all discussed from the viewpoint of recent developments. *Prereq. 10.327 or concurrently.*

12.508 Modern Chemistry II (Intro. to Organic Chemistry) (2 cl., 2 q.h.)
Classes of organic compounds, including hydrocarbons, alcohols, ethers, aldehydes, ketones, carboxylic acids, esters, amines and amides; carbohydrates, including the relationship with modern biology. *Prereq. 12.507 or equiv.*

12.509 Modern Chemistry III (Intro. to the Chemistry of Living Bodies) (2 cl., 2 q.h.)
Includes fats, proteins, enzymes, chemistry of digestion, and the chemical reactions characteristic of body fluids. *Prereq. 12.508 or equiv.*

12.515 Biochemistry I (2 cl., 2 q.h.)
The first quarter of a three-quarter course sequence. The sequence will cover introduction to the biochemistry of the cell, including the occurrence, chem-

istry, and metabolism of carbohydrates, lipids, proteins, and nucleic acids. *Prereq. 12.533 or equiv.*

12.516 Biochemistry II (2 cl., 2 q.h.)
A continuation of 12.515. *Prereq. 12.515.*

12.517 Biochemistry III (2 cl., 2 q.h.)
A continuation of 12.516. *Prereq. 12.516.*

12.521 Analytical Chemistry I (2 cl., 2 q.h.)
Analytical procedures and techniques; the principles of solution chemistry, ionic equilibria, and oxidation potentials applied to solving problems in chemical analysis. *Prereq. 12.546 and 12.549 or equiv.*

12.522 Analytical Chemistry II (2 cl., 2 q.h.)
Principles and practice of gravimetric and titrimetric methods of analysis. *Prereq. 12.521.*

12.523 Analytical Chemistry III (2 cl., 2 q.h.)
Theory of spectrophotometry, chomatography, and selected electro-analytical methods. *Prereq. 12.522.*

12.524 Analytical Chemistry Laboratory I (3 lab., 2 q.h.) (Laboratory Fee)
Qualitative analysis; separations by chemical means, chemical tests, and spot tests for inorganic ions in solution. *Prereq. 12.521 or concurrently or equiv.*

12.525 Analytical Chemistry Laboratory II (3 lab., 2 q.h.) (Laboratory Fee)
Chemical methods of quantitative analysis; procedures and techniques of gravimetric and volumetric methods of chemical analysis. *Prereq. 12.522 or concurrently or equiv.*

12.526 Analytical Chemistry Laboratory III (3 lab., 2 q.h.) (Laboratory Fee)
Instrumental methods of analysis; instruments and procedures for electrometric and optical methods of chemical analysis. *Prereq. 12.525 and 12.523 or concurrently or equiv.*

12.531 Organic Chemistry I (2 cl., 2 q.h.)
Nature of carbon in organic compounds; general principles of structure, nomenclature, preparation, uses, and reactions, of aliphatic hydrocarbons: alkanes, alkenes, alkynes, dienes, cycloalkanes; position and geometric isomerism; introduction to free radical and ionic mechanisms of reactions. *Prereq. 12.546 and 12.549 or equiv.*

12.532 Organic Chemistry II (2 cl., 2 q.h.)
Structure of benzene, electrophilic aromatic substitution reactions; general principles of structure, nomenclature, preparation, uses and reactions of the various types of organic compounds, including: alcohols, alkyl and aryl halides, ethers and expoxides and carboxylic acids; optical isomerism and introductory chemical kinetics will be discussed. *Prereq. 12.531 or equiv.*

12.533 Organic Chemistry III (2 cl., 2 q.h.)
A continuation of 12.532 with emphasis on the application of chemical interconversions to synthetic problems; functional derivatives of carboxylic acids, sulfonic acids and their derivatives, amines, diazonium compounds, phenols, aldehydes and ketones. *Prereq. 12.532 or equiv.*

12.534 Organic Chemistry Laboratory I (3 lab., 2 q.h.) (Laboratory Fee)
Coordinated with the lecture course, Organic Chemistry I, and deals with the preparation and properties of compounds discussed. *Prereq. 12.546 or equivalent and 12.531 or concurrently, or equiv.*

12.535 Organic Chemistry Laboratory II (3 lab., 2 q.h.) (Laboratory Fee)
Coordinated with the lecture course, Organic Chemistry II, and deals with the preparation and properties of compounds discussed. *Prereq. 12.534 or equiv.*

12.536 Organic Chemistry Laboratory III (3 lab., 2 q.h.) (Laboratory Fee)
Coordinated with the lecture course, Organic Chemistry III, and deals with the preparation and properties of compounds discussed. *Prereq. 12.535 or equiv.*

12.541 Physical Chemistry I (2 cl., 2 q.h.)
The three states of matter, atomic and molecular forces, physical properties and molecular structure; heat, work and heat capacity; thermochemistry. *Prereq. 10.323, 11.306, and 12.546 plus 12.549 or equiv.*

12.542 Physical Chemistry II (2 cl., 2 q.h.)
Thermodynamics, solutions, chemical equilibria, phase diagrams, and chemical kinetics. *Prereq. 12.541 or equiv.*

12.543 Physical Chemistry III (2 cl., 2 q.h.)
Electrical conductance, electromotive force, ironic equilibria, colloids, quantum theory, and photochemistry. *Prereq. 12.542 or equiv.*

12.544 General Chemistry I (2 cl., 2 q.h.)
Fundamental concepts; symbols, formulas, and equations; atomic structure and Periodic Law; chemical bonding; oxygen, ozone, and hydrogen; the gaseous state and gram mole volume; the liquid and solid states; water and hydrogen peroxide. *Prereq. 10.307 or 10.327 or concurrently or equiv. (Not open to students with credit for 12.311 or 12.314.)*

12.545 General Chemistry II (2 cl., 2 q.h.)
Solutions, solutions of electrolytes, colloids, oxidation and reduction reactions, periodic properties, halogens, chemical equilibrium, electrochemistry; acids, bases, and salts; sulfur family. *Prereq. 12.544 or equiv. (Not open to students with credit for 12.512 or 12.515.)*

12.546 General Chemistry III (2 cl., 2 q.h.)
Ionic equilibrium and weak electrolytes; solubility product principle, hydrolysis; nitrogen, phosphorous, and their compounds; boron, silicon, and their compounds; alkali and alkaline earth metals, metals of groups III and IV; nuclear chemistry; carbon and its compounds; biochemistry. *Prereq. 12.545 or equiv. (Not open to those students with credit for 12.513 or 12.516).*

12.547 General Chemistry Laboratory I (2 lab., 1 q.h.) (Laboratory Fee) Coordinated with the lecture course, General Chemistry I, and deals with the preparation and properties of elements and compounds discussed. *Prereq. 12.544 or concurrently or equiv. (Not open to those students with credit for 12.514.)*

12.548 General Chemistry Laboratory II (2 lab., 1 q.h.) (Laboratory Fee) Coordinated with the lecture course, General Chemistry II, and deals with the preparation and properties of elements and compounds discussed. *Prereq. 12.547 or equiv. (Not open to those students with credit for 12.315.)*

12.549 General Chemistry Laboratory III (2 lab., 1 q.h.) (Laboratory Fee) Qualitative analysis experiments, including unknown solutions. *Prereq. 12.548 or equiv. (Not open to those students with credit for 12.316.)*

12.551 Instrumental Analysis I (formerly Instrumental & Radiochemistry I) (2 cl., 2 q.h.)
Basic theory and instruments used in electrochemical analysis. Course includes such topics as electrode and cell potentials, potentiometric titrations, direct potentiometry (pH meters and specific ion electrodes), coulometry, polarography, amperometry, electrogravimetry, and conductivity. *Prereq. 12.523 or equiv.*

12.552 Instrumental Analysis II (formerly Instrumental & Radiochemistry II) (2 cl., 2 q.h.)
Basic theory and instruments used in spectrochemical analysis. Course includes such topics as electromagnetic spectrum, ultraviolet and visible spectrophotometry, infrared spectrophotometry, X-ray analysis, fluorescence and phosphorescence, emission spectrophotometry, absorption spectrophotometry, and gas chromatography. *Prereq. 12.551 or equiv.*

12.553 Radiochemistry (formerly Instrumental & Radiochemistry III) (2 cl., 2 q.h.) Radioactivity and nuclear reactions; production and study of nuclear reactions; equations of radioactive decay; nuclear states and radioactive processes; interaction of radiation with matter; radiation detection and measurement; statistics of radioactivity measurements; techniques for the study of radionuclides; tracers in chemical applications and nuclear energy. *Prereq. 12.552 or equiv.*

12.554 Physical Chemistry Laboratory I (3 cl., 2 q.h.) (Laboratory Fee) Experimental studies of viscosity, thermochemistry, and homogeneous equiplibrium. *Prereq. 12.542.*

12.555 Physical Chemistry Laboratory II (3 cl., 2 q.h.) (Laboratory Fee) Experimental studies of phase equilibrium, solution thermodynamics, and chemical kinetics. *Prereq. 12.554.*

EARTH SCIENCE

Students wishing to elect other earth science courses should refer to the University College Catalog and petition for approval by the Academic Standing Committee of Lincoln College.

16.531 Oceanology I (formerly Oceanography I) (2 q.h.)
Introduction to the origin of the global ocean; the physical and chemical properties of sea water; development of ocean currents and their effect on land masses of the world; problems of ocean pollution. *Prereq. 16.503 or equiv.*

16.532 Oceanology II (formerly Oceanography II) (2 q.h.)
The habitat zones and organisms of the sea; Phytoplankton, zooplankton, and nekton; economic importance of marine resources for expanding world population. *Prereq. 16.531 or equiv.*

16.533 Oceanology III (formerly Marine Geology) (2 q.h.)
Physiography and structure of ocean basins; marine geological processes and features; sedimentation, erosion, shorelines, and bottom topography; methods and techniques of marine geological explorations. *Prereq. 16.532 or equiv.*

BIOLOGY

Students wishing to elect other biology courses should refer to the University College Catalog and petition for approval by the Academic Standing Committee of Lincoln College.

18.507 Gross Anatomy and General Physiology I (2 cl., 2 q.h.)
Fundamental concepts of living organisms; chemical and biological characteristics of cellular metabolism; the skeletal system and its appendages; general nomenclature, anatomical names and terms. *Prereq. none.*

18.508 Gross Anatomy and General Physiology II (2 cl., 2 q.h.)
The systems of the body and the relationships between them; the structure and function of each. *Prereq. 18.507 or equiv.*

18.509 Gross Anatomy and General Physiology III (2 cl., 2 q.h.)
Continuation of the systems of the body and the relationship between them. *Prereq. 18.508 or equiv.*

18.511 Biology I (General) (3 cl., lab., 4 q.h.) (Laboratory Fee)
Universal properties and processes of living organisms; cellular composition and cellular activities; inheritance and cellular control. *Prereq. none.*

18.512 Biology II (Animal) (3 cl., 3 lab., 4 q.h.) (Laboratory Fee)
Functional anatomy of animal organ systems, their interactions and environmental relationships. *Prereq. 18.511 or equiv.*

18.513 Biology III Animal (3 cl., 3 lab., 4 q.h.) (Laboratory Fee)
Systematic comparative study of the structure and functions of animals. Diversity of animals considered from the standpoint of evolutionary adaptation. *Prereq. 18.512 or equiv.*

18.521 Microbiology I (2 cl., 4 lab., 4 q.h.) (Laboratory Fee)
Morphology and biochemistry of the bacteria. *Prereq. 18.513 or equiv.*

18.522 Microbiology II (2 cl., 4 lab., 4 q.h.) (Laboratory Fee)
Survey of pathogenic microorganisms. *Prereq. 18.521 or equiv.*

18.523 Microbiology III (2 cl., 4 lab., 4 q.h.) (Laboratory Fee)
Biology of the protista; the role of microorganisms in the environment and industry.

18.524 Human Anatomy and Physiology I (2 cl., 2 lab., 3 q.h.)
Introduction to human anatomy: osteology, anatomy of the muscular system, respiratory system, digestive system, the vascular systems, urogenital system. The laboratory includes a study of human bones and cat dissection. *Prereq. 18.506 or 18.513 or equiv.*

18.525 Human Anatomy and Physiology II (2 cl., 2 lab., 3 q.h.) (Laboratory Fee)
Principles of physiology and continuation of the study of human anatomy. The laboratory is mainly concerned with muscle physiology. *Prereq. 18.524 or equiv.*

18.526 Human Anatomy and Physiology III (2 cl., 2 lab., 3 q.h.) (Laboratory Fee)
Continuation of the principles of physiology. The anatomy and physiology of the nervous system, physiology of the endocrine system. The laboratory deals with physiology of respiration and the physiology of blood. *Prereq. 18.525 or equiv.*

18.560 Environmental Ecology (4 cl., 4 q.h.)
Biotic and abiotic aspects of the environment; geo-physico-chemocycles in the biosphere; food chain and the ecosystem; energy cycling; environmental pollution; population explosion and natural resources; future of man as a species; role of government, industry, and individuals in controlling the environment. *Prereq. none.*

18.561 Ecology I (2 cl., 2 q.h.)
Environmental factors; the soil system; water; the atmosphere; temperature, light, wind, pressure; the physico-chemical factors—CO_2, N, and mineral nutrients; habitat; distribution of plants and animals in the world according to temperature and precipitation. *Prereq. 18.513 or equiv.*

18.562 Ecology II (2 cl., 2 q.h.)
The ecosystem; ecological niche; the producers, consumers, and decomposers; the pond ecosystem, desert ecosystem, forest ecosystem, and sea shore ecosystem; energy cycle and efficiency of energy utilization; mass, weight, and energy pyramids. *Prereq. 18.561 or equiv.*

18.563 Ecology III (2 cl., 2 q.h.)
Population ecology; biotic community; population growth; relations between the species; symbiosis; competition; predation; succession. *Prereq. 18.562 or equiv.*

18.564 Man and His Biosphere I (2 cl., 2 q.h.)
An ecological analysis of the human situation and man's interaction with other organisms; the necessary foundation of biological principles will be presented.

18.565 Man and His Biosphere II (2 cl., 2 q.h.)
A continuation of Man and Environment I. *Prereq. 18.564 or equiv.*

LIBERAL ARTS

Students wishing to elect other humanities, social science, and natural science courses should refer to the University College Catalog and petition for approval by the Academic Standing Committee of Lincoln College.

19.501 Psychology I (2 cl., 2 q.h.)
An introductory survey of the historical backgrounds of psychology, psychological measurement and testing, and principles of animal and human learning. *Prereq. none.*

19.502 Psychology II (2 cl., 2 q.h.)
Principles of sensory processing, perception, motivation and emotion, and social influences on behavior. *Prereq. 19.501 or equiv.*

19.503 Psychology III (2 cl., 2 q.h.)
Personality theory and measurement, behavior disorders, mental health, and psychotherapy. *Prereq. 19.502 or equiv.*

19.507 Psychology (Intensive) (6 cl., 6 q.h.)
An introductory survey of the historical backgrounds of psychology, psychological measurement and testing, and principles of animal and human learning; principles of sensory processing, perception, motivation and emotion, and social influences on behavior; personality theory and measurement, behavior disorders, mental health, and psychotherapy. *(Not open to students who have taken 19.501, 502, 503.) Prereq. none.*

19.508 Fundamentals of Psychology I (4 q.h.)
Basic concepts from most areas of psychological investigation; the experimental orientation to the study of behavior, including child development, individual differences, learning, and social psychology. (Recommended for psychology majors.) *(Not open to students who have credit for 19.501, 502, 503.)*

19.509 Fundamentals of Psychology II (4 q.h.)
The sensory basis of behavior, cognition, perception, motivation, emotions, normal, and abnormal personality. (Recommended for psychology majors.) *(Not open to students who have credit for 19.501, 502, 503.) Prereq. 19.508 or equiv.*

21.501 Sociology I (2 cl., 2 q.h.)
Basic concepts and theories relating to the study of man as a participant in group life with emphasis on social structure, culture, socialization, and the family.

21.502 Sociology II (2 cl., 2 q.h.)
A continuation of Sociology I, with major emphasis on primary groups, associations, social stratification, collective behavior, and population. *Prereq. 21.501 or equiv.*

21.503 Sociology III (2 cl., 2 q.h.)
A continuation of Sociology II, focusing on the major institutional areas, with

particular attention to problems of social, political, urban, and industrial change. *Prereq. 21.502 or equiv.*

21.504 Sociology (Intensive) (6 cl., 6 q.h.)
Basic concepts and theories relating to the study of man as a participant in group life, with emphasis on social structure, culture, socialization, and the family; primary groups, associations, social stratification, collective behavior, and population; the major institutional areas, with particular attention to problems of social, political, urban, and industrial change. *(Not open to students who have taken 21.501, 502, 503.)*

21.601 Principles of Sociology I (4 q.h.)
An intensive introduction to basic concepts and theories relating to the study of man as a participant in group life. Emphasis is placed on socialization, culture, social structure, primary groups, family, social stratification, and population.

21.602 Principles of Sociology II (4 q.h.)
A continuation of Principles of Sociology I, with emphasis on a critical analysis of American society, with particular attention to problems of social, political, urban, and industrial change. *Prereq. 21.601 or equiv.*

23.501 Western Civilization I (2 q.h.)
The beginnings of Western Civilization with emphasis on the political, economic, and social history of ancient and medieval times to 1300.

23.502 Western Civilization II (2 q.h.)
Early Modern Europe from 1300 to 1789, with an examination of the two major intellectual movements, the Renaissance and the Enlightenment, and their impact on the rise of national states, capitalism, and Protestantism.

23.503 Western Civilization III (2 q.h.)
Modern Europe from 1789 to the present, emphasizing the rise of ideology in a technological age.

23.507 Western Civilization (Intensive) (6 cl., 6 q.h.)
The beginnings of Western civilization, with emphasis on the political, economic, and social history of the ancient and medieval world; modern Europe to 1815, with an examination of the two major intellectual movements—the Renaissance and the Enlightenment—and their impact upon religious movements, economic developments, and the rise of national states; Western civilization since 1815, emphasizing the Scientific and Industrial Revolutions and their impact upon democracy and authoritarianism, nationalism, and internationalism, and war and peace. *(Not open to students who have taken 23.501, 502, 503.) Prereq. none.*

23.509 Western Civilization A (3 q.h.)
Western Civilization to 1648.

23.510 Western Civilization B (3 q.h.)
Western Civilization since 1648.

27.541 Drawing I (3 q.h.)
Practice in the techniques and development of drawing in pencil and pen and ink, with concentration on basic drawing problems.

27.542 Drawing II (3 q.h.)
Practice in the techniques of wash drawing, scratch board drawing, and mixed medias. *Prereq. 27.541 or equiv.*

27.543 Drawing III (3 q.h.)
Study of human anatomy and the practice of figure drawing and composition. *Prereq. 27.542 or equiv.*

30.501 English for International Students I (2 cl., non-credit)
Introduction to English grammar for foreign-speaking students with an emphasis on listening, speaking, and writing; selected readings and exercises to strengthen vocabulary and pronunciation. *Prereq. none.*

30.502 English for International Students II (2 cl., non-credit)
A continuation for 30.501, emphasizing the preparation of written and oral reports and business and social correspondence. *Prereq. 30.501.*

30.503 English for International Students III (2 cl., non-credit)
Advanced work in written and spoken English preparatory to entering 30.504 English I. *Prereq. 30.502.*

30.600 Elements of Composition (2 q.h.)
An intensive study of grammatical forms and structural patterns of current English.

30.601 Composition and Rhetoric I (2 q.h.)
A detailed examination of the modes of rhetoric, especially exposition and argument, and the exercises in the development of paragraphs and short papers. *(Not open for students who have credit for 30.504.)*

30.602 Composition and Rhetoric II (2 q.h.)
A continuation of 30.601. Stress is on the short paper, the longer library paper, and formal documentation. *Prereq. 30.601. (Not open to students who have credit for 30.505.)*

30.603 Composition and Rhetoric (Intensive) (4 q.h.)
Same as 30.601 *plus* 30.602.

30.604 Introduction to Literary Forms I (2 q.h.)
The development of techniques for reading imaginative writing. Short and long fiction are the materials for study, discussion, and two critical papers. *Prereq. 30.602.*

30.605 Introduction to Literary Forms II (2 q.h.)
A continuation of 30.604, but here the materials are poetry and drama. *Prereq. 30.604.*

30.606 Introduction to Literary Forms (Intensive) (4 q.h.)
Same as 30.604 *plus* 30.605.

30.113 Freshman Writing (4 cl., 4 q.h.) (Day Curriculum)
Important principles of logic and rhetoric applied to exposition and argumentation writing; review of sentence structure, punctuation, and paragraphing; extensive reading and analysis of the essay form; theme assignments.

30.114 Introduction to Literature (4 cl., 4 q.h.) (Day Curriculum)
An introduction to literary forms: poetry, prose fiction, and drama; intensive reading in various forms and discussion of different approaches to literature. *Prereq. 30.113.*

30.115 Great Themes in Literature (4 cl., 4 q.h.) (Day Curriculum)
Content determined by instructor, who chooses a theme and a number of books from different periods to illustrate it. Examples: The Hero in Literature, Visions of Utopia, Science Fiction, etc. *Prereq. 30.114.*

BUSINESS MANAGEMENT

Students wishing to elect other business courses should refer to the University College Catalogue and petition for approval by the Committee on Education of Lincoln College.

39.115 Principles and Problems of Economics (4 cl., 4 q.h.) (Day Curriculum)
An introduction to the conceptual aspects of economics; the flow of national income; economic growth and fluctuation; the role of money and banking; monetary and fiscal policies. Emphasis on developing conceptual tools for use in the analysis of economic problems facing modern society.

39.501 Economic Principles and Problems I (2 cl., 2 q.h.)
Macro analysis-national income concepts and determination; macro economic goals and problems; monetary and fiscal policy. *Prereq. none.*

39.502 Economic Principles and Problems II (2 cl., 2 q.h.)
Micro analysis-theory of the firm and market structure; supply, demand, market price; international economics. *Prereq. 39.501.*

39.503 Economic Principles and Problems III (2 cl., 2 q.h.)
Applications of economic principles to selected problem areas; poverty, competition, labor, agriculture, urban. *Prereq. 39.502.*

39.510 Statistics for Quality Control (2 cl., 2 q.h.)
Fundamentals of statistical concepts and computations necessary to the understanding of statistical quality control; frequency distributions, measures of centering and dispersion; computation of average and standard deviation for ungrouped and grouped data; determination of areas under the normal distribution curve; standard deviation of the mean; combinations and permutations and their use of computer probabilities computations associated with the hypergeometric, binomial, and Poisson distributions. *Prereq. 10.503 or equiv.*

39.511 Statistics I (2 cl., 2 q.h.)
Introduction to the collection and organization of data; concentration on the nature, computation, and uses of measures of central tendency and variability. *Prereq. 39.503.*

39.512 Statistics II (2 cl., 2 q.h.)
Introduction to statistical inference, parameters of samples, tests of significance, "t" distribution, and chi square. *Prereq. 39.511.*

39.513 Statistics III (2 cl., 2 q.h.)
Introduction to the analysis of variance, trend fitting, linear regression, seasonal adjustment, and index numbers. *Prereq. 39.512.*

39.514 Statistics (Intensive) (6 cl., 6 q.h.)
Introduction to the collection and organization of data; concentration on the nature, computation, and uses of measures of central tendency and variability; introduction to statistical inference, parameters of samples, tests of significance, "t" distribution and chi square; introduction to the analysis of variance, trend fitting, linear regression, seasonal adjustment and index number. *(Not open to students who have taken 39.511, 512, 513.) Prereq. 39.503.*

41.501 Accounting Principles I (2 cl., 2 q.h.)
The basic concepts and methodology of accounting for service and merchandising businesses. (Offered every quarter on all campuses) *Prereq. none.*

41.502 Accounting Principles II (2 cl., 2 q.h.)
The problems of income measurement and valuation related to sources and uses of invested capital. (Offered every quarter) *Prereq. 41.501.*

41.503 Accounting Principles III (2 cl., 2 q.h.)
The use of debt and investments in managerial financial decisions, followed by a brief introduction into cost decision analysis. (Offered every quarter) *Prereq. 41.502.*

41.541 Accounting Principles (Intensive) (6 q.h.)
Basic concepts and methodology of accounting for service and merchandising businesses; the problems of income measurement and valuation related to sources and uses of invested capital; the use of debt and investments in managerial financial decisions, followed by a brief introduction into cost decision analysis. *(Not open to students who have taken 41.501, 502. 503.)* (Available at Boston, Burlington, and Weymouth campuses.)

45.501, 502, 503 Management and Organization I, II, III (6 q.h.)
An introduction to the American business system; comparison with other economic systems; principles and concepts of organization and management. Emphasis on topics such as the social responsibilities of business; business and its environment; business ethics, etc. Traditional material presented toward an understanding of modern American business and preparation for a business career. The environment within which business operates; a review of the theory and practice of organization; the "what" and "how" of the management process; an application of the concepts covered to the functional areas of business. (Offered every quarter on all campuses) *Prereq. 45.502, 503.*

45.541 Law I (2 cl., 2 q.h.)
CONTRACTS: Nature, kinds, and formation of contracts; essential elements; interpretation of contracts. (Available on most campuses) *Prereq. none.*

45.542 Law II (2 cl., 2 q.h.)
AGENCY: Nature, formation, and termination of agency relationships; rights and duties of principal and agent, scope of agent's authority. *Prereq. 45.541.*
SALES: Nature of sales contracts; warranties; transfer of title; rights and remedies of seller and buyer. (Available on most campuses) *Prereq. 45.541.*

45.543 Law III (2 cl., 2 q.h.)
NEGOTIABLE INSTRUMENTS: Bills, notes, and checks; liabilities and defenses of parties; procedure upon dishonor; discharge. *Prereq. 45.542.*
BUSINESS ORGANIZATIONS: Survey of corporations and partnerships. (Available on most campuses) *Prereq. 45.542.*

45.643 Law (Intensive) (6 q.h.)
CONTRACTS: Nature, kinds, and formation of contracts; essential elements; interpretation of contracts. AGENCY: Nature, formation and termination of agency relationships; rights and duties of principal and agent; scope of agent's authority. SALES: Nature of sales contracts; warranties; transfer of title; rights and remedies of seller and buyer. NEGOTIABLE INSTRUMENTS: Bills, notes, and checks; liabilities and defenses of parties; procedure upon dishonor; discharge. BUSINESS ORGANIZATIONS: Survey of corporations and partnerships. *Not open to students who have taken 45.541, 542, 543.* (Offered every quarter on Boston, Burlington, and Weymouth campuses)

45.561 Statistical Quality Control (2 cl., 2 q.h.)
Description and practical application of the basic statistical quality control methods for quality assurance, quality control, and quality improvement of products and services; the determination of process capability; the use of quality-control charts for measurable and nonmeasurable quality characteristics. (Offered Fall Quarter on most campuses) *Prereq. 39.513.*

45.562 Statistical Quality Control II (2 cl., 2 q.h.)
Continuation of Statistical Quality Control I, covering the application of statistical and probability considerations in acceptance sampling of purchased material, work-in-process, and outgoing products. Methods of predicting sampling results using the hypergeometric, the binomial, and the Poisson distributions; development of the operating characteristic curve for any sampling plan; risks involved in sampling and the concepts of AQL, RQL, AOQL. (Offered Winter Quarter on most campuses) *Prereq. 45.561.*

45.563 Management of Quality Control (2 cl., 2 q.h.)
Modern concepts of managing the quality function of a company to maximize customer satisfaction at minimum quality cost; the idea of total quality control; measurement of the costs of quality; development of a coordinated program of improvement; organizing for diagnosing the direct causes. (Offered Spring Quarter on most campuses)

45.608 Quality Control and Management (Intensive) (6 q.h.)
Same as 45.561, 562, and 563. *(Not open to students who have taken these courses.)* (Offered Fall Quarter on Boston campus only) *Prereq. 39.513.*

45.570 Electronic Data Processing I (2 cl., 2 q.h.)
An introduction to computers, including the discussion of numbering and coding systems; examples of typical business problems; and study of basic programming concepts. (Offered every quarter on all campuses) *Prereq. none.*

45.571 Electronic Data Processing II (2 cl., 2 q.h.)
A survey of available computer systems; price and performance comparison of available input, output, and storage media; discussion of filing and sorting techniques; and presentation of data communications concepts and terminals. (Offered every quarter on all campuses) *Prereq. 45.570.*

45.572 Electronic Data Processing III (2 cl., 2 q.h.)
A presentation of COBOL, FORTRAN, and other programming languages; discussion of business data processing and operations research applications; and a summary of trends in EDP. (Offered every quarter on all campuses) *Prereq. 45.571.*

45.648 Electronic Data Processing (Intensive) (6 q.h.)
An introduction to computers, including the discussion of numbering and coding systems; examples of typical business problems; a study of basic programming concepts; a survey of available computer systems; price and performance comparison of available input, output, and storage media; discussion of filing and sorting techniques; and presentation of data communications concepts and terminals; a presentation of COBOL, FORTRAN, and other programming languages; discussion of business data processing and operations research applications; and a summary of trends in EDP. *Not open to students who have taken 45.570, 571, 572.* (Offered every quarter on Boston, Burlington, and Weymouth campuses)

48.501 Transportation Management I (2 cl., 2 q.h.)
Basic principles of management and organization; evaluation of all transportation modes; primary concepts of freight classification and rates. *Prereq. none.*

48.502 Transportation Management II (2 cl., 2 q.h.)
Study of primary management functions—use of tariffs, routing, document processing, analysis of special carrier services and liabilities, and control of private carrier operations. *Prereq. 48.501.*

48.503 Transportation Management III (2 cl., 2 q.h.)
Appraisal of federal transport policy and introduction to factors of physical distribution—inventory control, warehousing, material handling, packaging, and international distribution. *Prereq. 48.502.*

48.504 Transportation Regulation and Promotion I (2 cl., 2 q.h.)
Study of the history and content of the Interstate Commerce Act. (Available on Boston campus only) *Prereq. 48.503.*

48.505 Transportation Regulation and Promotion II (2 cl., 2 q.h.)
Examination of Administrative Law and Procedure, the Code of Ethics, and the General Rules of Practice. *Prereq. 48.504.*

48.506 Transportation Regulation and Promotion III (2 cl., 2 q.h.)
Analysis of cases pertinent to the Commerce Clause and comprehensive preparation for the Interstate Commerce Commission Practitioners Examination. *Prereq. 48.505.*

48.514 Elements of Transportation and Distribution (2 q.h.)
An introduction to regulatory, economic, and management aspects of transportation from the viewpoints of shippers, government, and carrier managers. Topics include: costs, rates, operations, entry, mergers, intercity passenger and urban transportation. A course of general interest to students of business, law, or government. (Available on Boston, Burlington, Weymouth, and Norwood campuses) *Prereq. none.*

48.591 Transportation Management A (3 cl., 3 q.h.)
Evaluation of all transportation modes, singly and in combination with one another; analysis of the bill of lading and other transportation documents; study of primary concepts in transportation pricing; freight classification, classification rule, and freight dates; study of primary freight-management functions; use of tariffs and rate procedure with carrier bureaus and the Interstate Commerce Commission; routing and consolidation of freight. *Prereq. none.*

48.592 Transportation Management B (3 cl., 3 q.h.)
Special services performed by carriers—diversion and reconsignment, transit, protective services, storage, tracing, switching, pickup and delivery, weighing, loading and unloading; freight—claim procedure and prevention; management of a private transportation system; exporting and importing; inventory management; materials handling and packaging; warehousing; and factors of industrial location. *Prereq. 48.591.*

48.593 Air Transportation Management A (3 cl., 3 q.h.)
The economics and regulation of scheduled passenger service and scheduled-cargo service; corporate and general aviation policy making and procedures. *Prereq. none.*

48.594 Air Transportation Management B (3 cl., 3 q.h.)
Areas of specific study include route structures, equipment, scheduling, operations, pricing, cost analysis, and financing. *Prereq. 48.593.*

FIRE TECHNOLOGY

91.301 Fire Protection Science I (2 cl., 2 q.h.)
An overall review of the fire protection field, with the objective of providing career orientation. *Prereq. none.*

91.302 Fire Protection Science II (2 cl., 2 q.h.)
An overall review of the public fire service; the basic organization, manpower, and utilization of equipment by municipal fire departments. *Prereq. 91.301.*

91.303 Chemistry of Fires and Explosions (2 cl., 2 q.h.)
A study of the chemistry and physics of fire and some of the common hazards; electrical fires and fires caused by spontaneous heating and ignition as well as flammable liquids, gases, and hazardous chemicals; field and laboratory investigation of fires; explosions, explosives, and field and laboratory investigations of explosions. *Prereq. 91.302.*

91.304 Fire Prevention I (2 cl., 2 q.h.)
Eliminating human and economic fire losses; application of empirical and research knowledge in fire prevention measures. *Prereq. none.*

91.305 Fire Prevention II (2 cl., 2 q.h.)
An overview of collaborative efforts, and developing requirements and opportunities, in the interest of fire prevention and its corollary loss control. *Prereq. 91.304.*

91.306 Fire Apparatus Function and Design (2 cl., 2 q.h.)
An analysis of the procurement policies that should be followed in acquiring fire fighting apparatus and equipment with details on the type and amount for good fire fighting efficiency, including a discussion of fire department buildings; review of the physical properties of water that are pertinent to hydraulic calculations; discussion of hose, streams, and nozzles. *Prereq. none.*

91.307 Fire Protection Systems I (2 cl., 2 q.h.)
A study of the theories and mechanics involved in the operation of fire protection systems and equipment; fire detection and extinguishing systems of both automatic and manual types, including sprinkler, standpipe systems, and water spray protection. *Prereq. none.*

91.308 Fire Protection Systems II (2 cl., 2 q.h.)
A study of fire detection and suppression systems of the manual and automatic type; types of alarm systems, detectors, and actuators; systems using dry chemicals, carbon dioxide, foam, and Halon 1301; explosion prevention; suppression systems for buildings. *Prereq. 91.307.*

91.309 Fire Service Operations I (2 cl., 2 q.h.)
Fire service operations, its goal and objectives; management of fire service operations and various aspects of planning, organizing, delegation, staffing, implementing, directing, and controlling; systems approach to fire service management with management exercises. *Prereq. none.*

91.310 Fire Service Operation II (2 cl., 2 q.h.)
Fire service operation with respect to government and collective bargaining, leadership and discipline, performance analysis, communications and the importance of listening, effective speaking and report writing, records and budgets; fire service operation public relations in the community and the press. *Prereq. 91.309.*

91.311 Fire Service Operations III (2 cl., 2 q.h.)
Fire defense planning and development; determining fire defense requirements; organizing the defense and training programs; the fire officer as an instructor, evolution of system, strategy, tactics, and other types of emergencies. *Prereq. 91.310.*

91.312 Environmental Physiology (2 cl., 2 q.h.)
Fundamental principles in human physiology and the relationship of man to his physical and chemical environment. *Prereq. 12.509.*

SUPPLEMENTAL COURSES

93.300 Celestial Navigation I (2 cl., 2 q.h.)
Principles of celestial navigation, including celestial pole identification, use of sextant and corrections, latitude from morning, noon, and afternoon sightings, and enough descriptive astronomy for the required background. *Prereq. Math. Placement Test, 10.302 or equiv.*

93.301 Celestial Navigation II (2 cl., 2 q.h.)
Principles of celestial navigation continued, including solar time, reduction tables and forms, use of Nautical Almanac, applications of true azimuth of sun, and enough descriptive astronomy for the required background. *Prereq. 93.300.*

93.302 Celestial Navigation III (4 cl., 4 q.h.)
Principles of celestial navigation, including celestial pole identification, use of sextant and corrections, latitude from morning, noon, and afternoon sightings, solar time, reduction tables and forms, use of Nautical Almanac, applications of true azimuth of sun, and enough descriptive astronomy for the required background. *Prereq. Math. Placement Test, 10.302 or equiv.*

93.305 Survival Training (2 cl., 2 q.h.)
Training in and demonstration of modern techniques of human survival; methods in the wilderness environment. *Prereq. none.*

93.401 Technical Communications (4 cl., 4 q.h.)
Thought organization and effective sentences; written reports and instruction manuals; specifications and proposals; graphic aids and reproduction processes. *Prereq. 30.602.*

93.402 Technical Communications I (2 cl., 2 q.h.)
Thought organization and effective sentences; written reports and instruction manuals. *Prereq. 30.602.*

93.403 Technical Communications II (2 cl., 2 q.h.)
Specifications and proposals; graphic aids and reproduction processes. *Prereq. 93.402.*

AVIATION TECHNOLOGY

96.307 Introduction to Aircraft Design (1 cl., 2 lab., 2 q.h.)
Basic orthographic principles and interpretations of aircraft design; a presentation of basic aerodynamics, structural characteristics of aircraft, materials, and manufacturing processes. Laboratory work will involve aircraft construction. *Prereq. 10.391 and 11.391.*

96.308 Aircraft Power & Systems (4 cl., 4 q.h.)
Engine types, nomenclature, and engine development; engine cycles and principles, performance, power and its measurement, ratings; design and construction of parts and their functions; valve mechanisms and timing; cooling system, carburation, fuel system, ignition system, lubrication, and oil system design; hydraulic, pneumatic, electrical and mechanical systems; landing gear types, design, loads and limitations; landing gear retraction systems; general flight control systems including rudder, elevator, aileron, and flaps; loads and limitations de-icer systems for flight surfaces, propeller, and engine breathing systems; cabin pressure and oxygen systems; airspeed and general air-driven instrument systems. *Prereq. none.*

96.309 Introduction to Aerodynamics (1 cl., 1 q.h.)
A non-calculus presentation of basic fluid dynamics and principles of fluid flow. Includes continuity, Bernoulli, and momentum equations; streamlines, stream tubes, drag, theory of lift, wing theory, vortex flow, ground effect, stalls, boundary layer, flow separation, control surfaces, stability, and balance. *Prereq. 10.308 and 11.318 or concurrently.*

96.310 Basic Helicopter Aerodynamics (2 cl., 2 q.h.)
General aerodynamics; helicopter components and their functions; loads and load factors; gyroscopic procession principle; performance; introduction to flight manual, helicopter operations in confined areas, precautionary measures and critical conditions. *Prereq. 96.392.*

96.311 Aviation Meteorology I (2 cl., 2 q.h.)
A survey of the principles of meteorology and structure of the atmosphere; meteorological instruments and observations. *Prereq. 11.306 or equiv.*

96.312 Aviation Meteorology II (2 cl., 2 q.h.)
Weather map interpretation and common aviation weather teletype codes; physical approach to pressure, temperature, basic thermodynamics, stability, and cloud formations. *Prereq. 96.311.*

96.313 Climatology (2 cl., 2 q.h.)
Climate causes and effects; climatology of several regions of the world; application of climatology to problems of airport location and construction, airline operation, and private flying. *Prereq. 96.312.*

36.321 Avionics I (2 cl., 2 q.h.)
Review of basic electronic principles, hazards, aircraft electrical systems, FCC regulations, selection, installation, and service of avionics, strobe lights, radio communications. *Prereq. 03.309 or 03.395.*

96.322 Avionics II (2 cl., 2 q.h.)
Antennas, ADF, omni, localizer, marker beacon, audio systems, transponders. *Prereq. 96.321.*

96.323 Avionics III (2 cl., 2 q.h.)
Glide slope, DME, RNAV, radar, INAV, autopilots. *Prereq. 96.322.*

96.324 Introductory Avionics (4 cl., 4 q.h.)
Basic coverage of electronics including: vacuum tube principles, semiconductor physics principles, power supplies, amplifiers, oscillators, and pulse circuits; generator and motor principles and applications; basic concepts of avionics, electrical hazards, aircraft electrical systems, electrical instruments, strobe lights, FCC regulations, radio communications, and antennas. *Prereq. 11.319.*

96.325 Avionics (4 cl., 4 q.h.)
Selection, installation, and servicing of avionics, automatic direction finders, marker beacons, omnirange and localizers, audio switching systems, ATC transponders, glide slope systems, distance measuring equipment, autopilots, and radar. *Prereq. 96.324.*

96.326 Avionics Laboratory I (3 lab., 2 q.h.)
Experiments dealing with laboratory techniques in measuring instruments, signal generators, and oscilloscopes; junction and field effect transistor characteristics; filter circuits; Q meter, coils with iron cores; vacuum and semi-conductor diode; power supplies including the regulated type, silicon controlled rectifier, transistor amplifiers. *Prereq. 96.324 and 96.325.*

96.327 Avionics Laboratory II (3 lab., 2 q.h.)
Experiments in oscilloscopes, double-tuned transformers, audio frequency oscillators, modulation of class C amplifiers, the diode detector, RF and crystal oscillators; testing of a radio receiver; reactance modulators, F.M. detectors. *Prereq. 96.326.*

96.328 Avionics Laboratory III (3 lab., 2 q.h.)
Experiments in navigation equipment for aircraft. *Prereq. 96.327.*

96.329 Radio Communications I (2 cl., 2 q.h.)
Preparation for second-class Radiotelephone License Examination, Elements I, II, and III; theory and Q and A review of direct current circuits and components, alternating current circuits and components, vacuum tubes and transistors, vacuum tube and transistor circuits, audio frequency equipment, radio frequency amplifiers, power supplies, oscillators, and modulation. *Prereq. 96.324.*

96.330 Radio Communication II (2 cl., 2 q.h.)
Continuation of Radio Communications I. Theory and Q and A review of detectors, transmitters, receivers, batteries, motors and generators, measuring and measuring instruments, propagation of radio waves, antennas, rules and regulations. *Prereq. 96.329.*

96.331 Primary Flight I (2 lab., $1\frac{1}{2}$ q.h.)
Elements of flight principles (pre-flight operations), operation of aircraft systems; taxi operations and ground performance; basic flight maneuvers; take-offs and landings. *Prereq. Class I or II, medical certificate.*

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*See Flight Tuition Schedule, pages 56 and 57.

***96.332 Primary Flight II** (2 lab., 1 1/2 q.h.)
Review of basic flight maneuvers; advanced maneuvers and stall procedures; short field take-offs and landings; power approaches and landing under varying conditions; emergency operation of aircraft equipment. *Prereq. 96.331. Student must have a current endorsement for solo flight.*

***96.333 Primary Flight III** (2 lab., 1 1/2 q.h.)
Cross country flight planning and flight; lost procedures and related emergencies; use of radio and navigation equipment under V.F.R. (visual flight rules); control of aircraft by reference to flight instruments only; private license qualifications complete. *Prereq. 96.332. Student must have a current endorsement for solo cross country flight.*

***96.341 Commercial Flight I** (2 lab., 1 1/2 q.h.)
Review of all primary flight maneuvers; advanced maneuvers; precision take-offs and landings; cross wind techniques. *Prereq. 96.333.*

***96.342 Commercial Flight II** (2 lab., 1 1/2 q.h.)
Precision flight maneuvers—spirals about a point; shallow and steep onpylon eights; 720° steep power turns; solo practice. *Prereq. 96.341.*

***96.343 Commercial Flight III** (2 lab., 1 1/2 q.h.)
Continuation of precision maneuvers—lazy eights, chandelles, maneuvers at minimal controllable airspeed; continued related simulator practice; night flying; basic instrument flying. *Prereq. 96.342.*

***96.344 Commercial Flight IV** (2 lab., 1 1/2 q.h.)
Stalls from all normally anticipated flight altitudes with and without power; simulated emergency procedures and forced landings; basic instrument flying. *Prereq. 96.343.*

***96.345 Commercial Flight V** (2 lab., 1 1/2 q.h.)
Advanced cross country flight planning and navigation; advanced radio communications and traffic procedures; review of all maneuvers and procedures. Certification by F.A.A. *Prereq. 96.344.*

***96.351 Instructional Flight I** (2 lab., 1 1/2 q.h.)
Fundamentals of flight instruction; development of student-instructor relationship and rapport; teaching procedures in flight training; instructor responsibilities and record maintenance; instructor flight demonstrations; qualification and certification by F.A.A. *Prereq. 96.345* and *96.354 or concurrently.*

***96.352 Instructional Flight II** (2 lab., 1 1/2 q.h.)
Continuation of fundamentals of instruction; flight training procedures; student-instructor relationship; review of all maneuvers and flight demonstrations. Certification by F.A.A. *Prereq. 96.351.*

96.354 Principles of Flight Instruction (2 cl., 2 q.h.)
Fundamentals and principles of instructing; learning concepts of teacher-student

*See Flight Tuition Schedule, pages 56 and 57.

ommunications; use of special flight teaching aids and training procedures. *Prereq. 96.345 or equivalent test*

96.355 Instrument Instructor Flight A (2 lab., 2 q.h.)
'undamentals and procedures for teaching operating limitations of all instruments, control of rate of climb and descent to pre-determine altitudes, procedures for coping with unusual altitudes and critical situations.

96.356 Instrument Instructor Flight B (2 lab., 2 q.h.)
rinciples and procedures of teaching methods in instrument flight planning nd enroute weather analysis, radio communication, and enroute navigation and rientation. Oral exam and flight test preparation.

6.357 Multi-Engine Flight (2 lab., 1½ q.h.)
reparation for an F.A.A. multi-engine rating test which includes an oral exam n the aircraft documents performance and operating characteristics; multingine flight instruction on basic piloting techniques and emergency procedures.

6.358 Helicopter A (2 lab., 2 q.h.)
lements of flight principles, operations of helicopter systems; hovering flight; ake-off, hover, forward climb, pattern, power-glide approach, transition to overing, vertical landing; square patterns; crosswind take-off and landing; unning take-off and landing autorotations. *Prereq. Commercial Fixed Wing icense; Class I or II medical certificate.*

6.359 Helicopter B (2 lab., 2 q.h.)
eview and practice take-offs, landings, all maneuvers, plus settling with power nd recovery, quick stops, precision pattern and landing; solo practice; dual eview for F.A.A. Flight Test. *Prereq. 96.358.*

6.360 Aircraft Analysis I (2 cl., 2 q.h.)
presentation of subsonic aerodynamics and structural characteristics of aircraft. *Prereq. 11.317.*

96.361 Instrument Flight I (2 lab., 1½ q.h.)
istrument flight planning, preparing, and filing; aircraft performance (range nd fuel requirements); required instruments and their proper use; basic instrument flying, needle ball, and airspeed only; instrument use in turns, climbs, escents, stalls, and approach speeds; recovery from unusual altitudes; airwork sing all altitudes instruments. *Prereq. 96.345.*

96.362 Instrument Flight II (2 lab., 1½ q.h.)
adio navigation while flying on instruments; use of L.F. (low frequency), omnirange, or A.D.F. (automatic direction finder); advanced radio communications; strument approaches, holding procedures, missed approach procedures, mergencies (radio and instrument malfunctions); air traffic control instructions nd procedure. Rating by F.A.A. *Prereq. 96.361.*

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*See Flight Tuition Schedule, pages 56 and 57.

96.363 General Aviation Operations I (2 cl., 2 q.h.)
A presentation of the major functions of airport management—organization, zoning, adequacy, financing, revenues and expenses, evaluation, and safety; the airport and its socioeconomic effect on the community. *Prereq. none.*

96.364 General Aviation Operations II (2 cl., 2 q.h.)
Study and analysis of airport functions, such as fixed base operators, pilot training schools; airtaxi operations in both charter and schedule activities. *Prereq. 96.363.*

96.365 General Aviation Operations III (2 cl., 2 q.h.)
A continuation through case studies of general aviation operations. *Prereq. 96.364.*

96.366 General Aviation Operations (Intensive) (6 q.h.)
A presentation of the major functions of airport management—organization, zoning, adequacy, financing, revenues and expenses, evaluation, and safety; the airport and its socioeconomic effect on the community; study and analysis of airport functions, such as fixed base operators, pilot training schools; airtaxi operations in both charter and schedule activities.

96.370 Air Cargo Practices A (3 cl., 3 q.h.)
Study of airline and air freight forward cargo practices with emphasis on regulation, economics, marketing, and handling and organizational aspects.

96.371 Air Cargo Practices B (3 cl., 3 q.h.)
A continuation through case studies of air cargo operations.

96.372 Airline Traffic and Sales A (3 cl., 3 q.h.)
Functions of the traffic and sales department; relationship between the travel agencies and the airlines; relationships with other carriers; reservations and the procedures involved in the transportation of one passenger of NCA and another carrier; airlines promotion; the reservation agent and training.

96.373 Airline Traffic and Sales B (3 cl., 3 q.h.)
Tariffs and schedules with an explanation of how flight times are established; flight frequencies; new routes; and the establishment of ticket fares; aspects of cargo and charters.

96.376 General Aviation Operations A (3 cl., 3 q.h.)
A presentation of the major functions of airport management; organization, zoning, adequacy, financing, revenues and expenses, evaluation, and safety; the airport and its socioeconomic effect on the community. *Prereq. none.*

96.377 General Aviation Operations B (3 cl., 3 q.h.)
Study and analysis of airport functions, such as, fixed base operators, pilot training schools; airtaxi operations in both charter and schedule activities. *Prereq. 96.376.*

*See Flight Tuition Schedule, pages 56 and 57.

96.378 Air Traffic Control Systems A (3 cl., 3 q.h.)
Survey of the total aerospace system and management; air traffic administrative coordination; regional responsibilities; NAFEC organization of center, tower, and station.

96.383 Advanced Aircraft Analysis (2 cl., 2 q.h.)
A presentation of supersonic aerodynamics and structural characteristics of aircraft. *Prereq. 11.318.*

96.384 Aviation History (3 cl., 3 q.h.)
Historical survey of efforts in manned flight, aircraft development, pioneers in flight, general aviation, military and commercial aspects of flight, and effects on modern civilization. *Prereq. none.*

***96.390 Pilot Refresher** (2 lab., 1½ q.h.)
This course consists of 24 hours of concentrated instruction and evaluation of pilot proficiency in advanced instrument flying and instructional flight procedures. It involves simulator flight, aircraft flight, ground instruction, and the updating of current procedures in flight instruction and flight planning procedures. *Prereq. special permission of flight director.*

96.391 Air Science & Navigation A (3 cl., 3 q.h.)
Aircraft structures and components; aerodynamic forces; airfoil terminology—lift and drag coefficient; boundary layer problems and control; Reynolds Number and Scale Effect; earth in space; latitude; longitude; properties and components of the atmosphere; map projections; dead reckoning; reciprocating engine theory; gas turbine engine theory; planform effects; aircraft weight and balance.

96.392 Air Science & Navigation B (3 cl., 3 q.h.)
Radio navigation; VOR, ADF, DME, and TACAN; federal air regulations; airplane performance (climb, range, altitude, takeoff, and landing); aircraft propeller theory and operation; specific aircraft substructures (landing gear et. al.); advanced DR navigation problems (radius of action, unknown wind); general review. *Prereq. 96.391.*

96.393 Advanced Air Science & Navigation A (3 cl., 3 q.h)
Supersonic aerodynamics physiologic factors of flight; instrument flight charts; IFR planning; instrument flight rules; static and dynamic axial stability of aircraft; control movements and forces; stability problems. *Prereq. 96.392.*

96.394 Advanced Air Science and Navigation B (3 cl., 3 q.h.)
Spins and spin recoveries; flying high performance aircraft; area charts; arrival and departure; SID charts; clearance notation; aircraft performance; applications of aerodynamics to specific problems of flight; helicopter stability; structural strength limitations; doppler radar; precision approach radar and airport surveillance radar; loran; consolan; pressure pattern flight. *Prereq. 96.393.*

96.395 Meteorology & Climatology A (3 cl., 3 q.h.)
A survey of the principles of meteorology and structure of the atmosphere;

*See Flight Tuition Schedule, pages 56 and 57.

meteorological instruments and observations; weather map interpretation and common aviation weather teletype codes. *Prereq. 11.392.*

96.396 Meteorology & Climatology B (3 cl., 3 q.h.)
Physical approach to pressure, temperature, basic thermodynamics, stability, and cloud formations; climate causes and effects; climatology of several regions of the world; application of climatology to problems of airport location and construction, airline operation, and private flying. *Prereq. 96.395.*

96.399 Flight Physiology (2 cl., 2 q.h.)
The study of the physical and chemical processes of the body; functions of the living body and its environment; adaptive changes of function of the body resulting from a change in environment with emphasis on flight; the effects of medication on the function and reactions of the body with emphasis on flight; the effects of the state of the mind on the function and reactions of the body with emphasis on flight.

96.401 Aircraft Engines I (2 cl., 2 q.h.)
Engine types, nomenclature, and engine development; engine cycles and principles, performance, power and its measurement, ratings; design and construction of parts and their functions; valve mechanisms and timing; cooling system, carburetion, fuel system, ignition system, lubrication, and oil system design.

96.402 Aircraft Engines II (2 cl., 2 q.h.)
A presentation of turbo-engine types and their development; radial flow and axial flow types, turbo-prop, compounding, ram jets, pulse jets and rockets; principles of combustion and propulsion, performance, power, thrust, and their measurement, design, and construction; fuel, lubrication, and ignition systems.

96.425 Chronology of Aviation I (2 cl., 2 q.h.)
1903-1939; early flights 1903-1914 era; World War I 1914-1918 era; airmail and barnstorming era; famous pilots and company histories traced 1920-1939 era, including history of air racing. *Prereq. none.*

96.426 Chronology of Aviation II (2 cl., 2 q.h.)
1939-present; World War II 1939-1945 era; all personalities and company histories traced; post World War II up to Apollo 17, final flight in Apollo program. *Prereq. none.*

96.430 Aviation Preventive Maintenance (2 cl., 2 q.h.)
For pilots and aircraft owners. Airframe and powerplant nomenclature, structures, and systems; maintenance that a pilot can and is allowed to do to the airframe and engine of his aircraft; proper techniques. *Prereq. none.*

96.431 Aircraft Systems (2 cl., 2 q.h.)
Hydraulic, pneumatic, electrical, and mechanical systems; landing gear types, design, loads, and limitations; landing gear retraction systems; general flight control systems including rudder, elevator, aileron, and flaps; loads and limitations; de-icer systems for flight surfaces, propeller, and engine breathing systems; cabin pressure and oxygen systems; airspeed and general air-driven instrument systems. *Prereq. none.*

96.432 Aircraft Laboratory (2 lab., 1 q.h.)
Aircraft construction methods and techniques will be applied to the construction of aircraft components. *Prereq. none.*

NEW GENERAL INTEREST COURSES

In response to repeated requests, we are offering several new courses in technology which do not require students to have a mathematical background. These courses have a three-fold purpose: 1) we would like to encourage liberal arts and business students to get interested in technology; 2) we hope that new students without mathematic backgrounds will be sufficiently attracted to science and technology that they will ultimately undertake our regular curricula; 3) these courses should serve to clarify the complexities of our technological world for anyone who chooses to undertake them.

01.401 Technology of Modern Architecture I (2 cl., 2 q.h.)
The general background of architectural styles, both historical and contemporary, with emphasis on the engineering design aspects and construction procedures concerned with the various types of buildings involved. *Prereq. none.*

01.402 Technology of Modern Architecture II (2 cl., 2 q.h.)
Contemporary architecture, with an emphasis on the engineering design aspects and construction procedures required for modern buildings. *Prereq. none.*

02.401 Man and Materials (2 cl., 2 q.h.)
The consumption of earth's raw materials has increased drastically, creating serious ecological problems. Metals, plastics, ceramics, concrete, etc. evolve from substances in the earth's crust; unfortunately however, they are not properly recycled because costs have always come before environment. This course will explore what action man may taken now to prevent chaos in the future. *Prereq. none.*

03.401 Electric Devices and Systems I (2 cl., 2 q.h.)
A non-mathematical examination of electric and electronic devices which have become a part of daily living; analysis of functional demands and their realization in elementary working systems; ratings and applications of devices, including light, heat, and mechanical energy convertors. *Prereq. none.*

03.402 Electric Devices and Systems II (2 cl., 4 q.h.)
A continuation of 03.401; discussion of modern communications systems, radio, TV, telephone; economic trade-off in designs; energy sources and energy conversion, transmission systems; rate basis implications of increased load base; atomic vs. fossil fuels. *Prereq. 03.401.*

09.401 Interpretation of Industrial Drawings (2 cl., 2 q.h.)
Emphasis on the understanding of the concepts conveyed by working engineering drawings; practice is provided in reading and interpreting the standard conventions and symbols used to transmit the designer's ideas to the tradesman

or craftsman. No formal drafting will be done, although a few freehand sketches will be encouraged. *Prereq. none.*

10.401 Foundations of Mathematics I (2 cl., 2 q.h.)
The many branches of mathematics; origins of arithmetic and algebra and their place in early societies. *Prereq. none.*

10.402 Foundations of Mathematics II (2 cl., 2 q.h.)
Mathematics and the scientific revolution; functions, graphs, concepts of the calculus. *Prereq. 10.401.*

10.403 Foundations of Mathematics III (2 cl., 2 q.h.)
Mathematics today: analysis, probability, statistics, and other topics; the mutual dependence of mathematics and computers; math in social sciences, physical sciences, and business. *Prereq. 10.402.*

11.401 Man's Physical Environment I (2 cl., 2 q.h.)
The nature of energy; its sources and the economics of its expenditure; the harmonious interactions of natural physical systems and the conservations which govern them; man's exploitations of these laws; the cyclic nature of useful physical processes; reversible and irreversible. *Prereq. none.*

11.402 Man's Physical Environment II (2 cl., 2 q.h.)
The methods by which man gains knowledge of two inscrutable areas of his environment; effects of scale from astro-physical to atom; the paradoxical implications of this knowledge and its effect on man's dealings with his environment. *Prereq. none.*

LINCOLN COLLEGE ENGINEERING TECHNOLOGY

EVENING COURSES LISTED WITH EQUIVALENT DAY BET COURSES

Evening Courses		Day BET Courses	
02.301, 02.302	Mechanics (Statics) I, II	02.411	Mechanics A
02.303, 02.304	Mechanics (Statics) III, Mechanics (Dynamics) I	02.412	Mechanics B
02.305, 02.306	Mechanics (Dynamics) II, III	02.413	Mechanics C
02.321, 02.322	Stress Analysis I, II	02.414	Stress Analysis A
02.323, 02.324	Stress Analysis III, Adv. Stress Analysis I	02.415	Stress Analysis B
02.325, 02.326	Advanced Stress Analysis II, III	02.416	Stress Analysis C
02.327, 02.328	Mechanical Design, I, II	02.417	Mechanical Design A
02.329	Mechanical Design III	02.418	Mechanical Design B
02.351, 02.352	Thermodynamics I, II	02.421	Thermodynamics A
02.353, 02.357	Thermodynamics III, Heat Engineering (Refrigeration) I	02.422	Thermodynamics B

Evening Courses		Day BET Courses	
02.358, 02.359	Heat Engineering II, III	02.423	Thermodynamics C
02.354	Heat Transfer	02.414	Thermodynamics D
02.355, 02.356	Heat Transfer II, III	02.425	Thermodynamics E
02.341, 02.342	Materials I, II	02.431	Materials A
02.343, 02.344	Materials III, Applied Metallurgy I	02.432	Materials B
02.345, 02.346	Applied Metallurgy II, III	02.433	Applied Metallurgy
01.341, 01.342	Fluid Mechanics I, II	02.441	Fluid Mechanics A
01.343	Fluid Mechanics III	02.442	Fluid Mechanics B
02.337, 02.338	Mechanical Vibrations I, II	02.451	Mechanical Vibrations
02.334, 02.335	Exp. Stress Analysis I, II	02.452	Experimental Stress Analysis
02.331	Mechanical Technology Laboratory I	02.462	Mechanical Technology Laboratory I
02.332	Mechanical Technology Laboratory II	02.463	Mechanical Technology Laboratory II
02.333	Mechanical Technology Laboratory III	02.464	Mechanical Technology Laboratory III
02.361	Heat Technology Laboratory I	02.465	Heat Technology Laboratory I
02.362	Heat Technology Laboratory II	02.466	Heat Technology Laboratory II
03.306	Electrical Measurements (Plus 2 q.h.)	03.410	Electrical Measurements
03.320, 03.321	Electricity & Electronics I, II	03.420	Electricity & Electronics I
03.322	Electricity & Electronics (Plus 2 q.h.)	03.421	Electricity & Electronics II
11.322, 11.323	Semiconductor Physics I, II	03.440	Physical Electronics
03.331, 03.333	Energy Conversion I, III	03.430	Energy Conversion
03.301, 03.302	Circuit Theory I, II	03.451	Circuit Analysis I
03.303, 03.304	Circuit Theory III, IV	03.452	Circuit Analysis II
03.361, 03.362	Transients in Linear Systems I, II	03.453	Circuit Analysis III
03.363	Transients in Linear Systems (Plus 2 q.h.)	03.354	Circuit Analysis IV
10.324, 10.325	Differential Equations I, II	03.460	Engineering Analysis I

Evening Courses		Day BET Courses	
03.371, 03.372	Analog and Digital Computers I, II	03.470	Digital Computers
03.377, 03.378	Control Systems I, II	03.477	Control Engineering I
03.379	Control Systems III (Plus 2 q.h.)	03.478	Control Engineering II
03.397, 03.398	Optical Instrumentation I, II	03.490	Optical Instrumentation
04.381, 04.383	Nuclear Technology I, III	04.481	Nuclear Technology
09.351	Principles of Computer Programming I	09.421	Principles of Computer Prog. I
09.352	Principles of Computer Programming II	09.422	Principles of Computer Prog. II
09.353	Principles of Computer Programming III	09.423	Principles of Computer Prog. III
09.311	Engineering Graphics I	09.461	Engineering Design Graphics I
09.312	Engineering Graphics II	09.462	Engineering Design Graphics II
09.313	Engineering Graphics III	09.463	Engineering Design Graphics III
09.307	Electrical & Electronic Graphics I	09.461	Engineering Design Graphics I
09.308	Electrical & Electronic Graphics II	09.462	Engineering Design Graphics II
09.309	Electrical & Electronic Graphics III	09.463	Engineering Design Graphics III
09.314, 09.315	Engineering Design I, Engineering Design II	09.464	Engineering Design Graphics IV
10.307	College Algebra & Trig. I	10.307	College Algebra & Trig. I
10.308	College Algebra & Trig. II	10.308	College Algebra & Trig. II
10.320	Calculus I	10.320	Calcalus I
10.321, 10.322	Calculus II, III	10.421	Calculus A
10.323, 10.324	Calculus IV, Differential Equations I	10.422	Calculus B
10.325, 10.326	Differential Equations II, III	10.423	Differential Equations
11.317	Physics I	11.317	Physics I
11.318	Physics II	11.318	Physics II
11.319	Physics III	11.319	Physics III
11.373	Physics Lab. I	11.373	Physics Laboratory I
11.374	Physics Lab. II	11.374	Physics Laboratory II
11.321, 11.331	Wave Phenomena, Modern Physics	11.420	Physics IV

the lincoln college faculty

THE STRENGTH of an educational institution lies in the quality of its faculty. This is especially true in a college devoted to the training of mature men and women, many of whom are already employed in their chosen professions.

The instructional staff of Lincoln College is composed of professional academicians from Northeastern University and neighboring educational institutions and practicing professionals from the scientific and industrial community of Greater Boston. The theoretical training and practical experience represented by this combination of specialists is ideally suited to the technology programs they teach and the adult students they serve.

The faculty are selected for their ability and active interest in the welfare of ambitious part-time students. They are men and women of culture and high ideals and are qualified by educational training and professional experience to teach effectively in their respective fields.

A staff of experienced professional educators who serve as program and course consultants constitutes the Academic Advisory Council and Curriculum Advisory Committee of the College. They guide, supervise, and assist with the administration of courses and programs.

THE FACULTY

The following is an alphabetical list of the faculty of Lincoln College; degrees earned; professional affiliation; titles and Lincoln College department (year of appointment).

Arnold M. Aaron, B.S., M.S.
Teaching Assistant, Electrical Engineering, Northeastern University.
Electrical Engineering Technology (1974)

Charles D. Aaronson, B.S., M.S.
Electrical Engineering Manager for McPherson Instr. Corp.
Electrical Engineering Technology (1964)

Sherif M. Abdel-Monem, B.S., M.S.
Teaching Assistant, Electrical Engineering, Northeastern University.
Electrical Engineering Technology (1973)

Arnold W. Almquist, Jr., B.S., M.Ed.
Instructor of Mathematics, Needham High School.
Mathematics (1967)

George H. Anderson, Commercial Art Diploma
Professional Artist; Free Lance Technical Illustrator.
Engineering Graphics and Computation (1956)

Will C. Anderson, B.S., M.S.
Senior Engineer, Raytheon Corporation.
Engineering Graphics and Computation (1968)

*Robert B. Angus, Jr., B.S., M.S., P.E. (Mass.)
Service Director, Technical Education Research Centers.
Electrical Engineering Technology (1948)

Victor S. Aramati, M.S., B.S.
Bell Telephone Laboratories
Mechanical Engineering Technology (1970)

Nathan Aron
Engineer, Raytheon Inc.
Electrical Engineering (1973)

Louis E. Ashley, A.B., M.Ed.
Product Development Section, Arthur D. Little, Inc.
Mechanical Engineering Technology (1966)

Alfred E. Attard, B.S., M.A., Ph.D.
Research Associate, Northeastern University.
Physics (1971)

*Robert J. Averill, B.S., M.S.
Projects Manager, Sala Magnetics, Inc.
Course Consultant for Electrical Engineering Technology (1957)

*Russell H. Babcock, S.B., S.M., P.E. (Mass., Maine, N.H., R.I., Vt., Conn., N.Y.)
Diplomate, American Academy of Environmental Engineers;
Chief Engineer, C. E. Maguire, Inc.
Civil Engineering Technology (1954)

John C. Balsavich
Laboratory Supervisor, Electrical Engineering, Northeastern University.
Electrical Engineering Technology (1957)

Westley P. Barry, BBA, Eng. & Mgt.
Vice President, McBar Associates.
Electrical Engineering Technology (1971)

*Appointed to the rank of Senior Lecturer

Samuel W. Bartol, B.A.
CFI Multiengine & Instrument Ratings, Wiggins Airways.
Aviation (1969)

Adolph Baumann, B.S., P.E. (Mass.)
Lecturer, Electronics Engineering, Northeastern University.
Electrical Engineering Technology (1955)

Fred E. Bellows, Jr., B.S., M.Ed.
Principal, East Elementary School, Sharon.
Aviation Technology (1968)

Walter E. Benulis, B.S., M.S.
Research Associate, M.E. Department, Northeastern University.
Mechanical Engineering Technology (1969)

Matteo P. Berardi, B.S., M.S.
Materials Coordinator.
Mechanical Engineering Technology (1960)

Maureen P. Berggren, B.S.
Mathematics (1965)

Alfred L. Birch, B.S.E.E., P.E. (Mass.)
Dept. Head, Development Engineering, Western Electric Co.
Electrical Engineering Technology (1965)

Emmanuel E. Bliamptis, B.S., S.M., M.A., P.E. (Mass.)
Research Physicist, Air Force Cambridge Research Labs.
Physics (1965)

Joseph I. Bluhm, S.B., M.S., P.E. (Mass.)
Chief Mechanics Research Laboratory,
Army Materials and Mechanics Research Center.
Mechanical Engineering Technology (1966)

Sidney Bluhm, A.B., Ed.M., A.M.
Head, Science Department, Boston Technical High School (Retired).
Physics (1965)

Edward Bobroff, B.M.E., P.E. (Mass.)
Chief Engineer, Combat Systems, Boston Naval Shipyard (Retired).
Electrical Engineer, United Engineers and Constructors.
Course Consultant for Mathematics (1946)

Edward J. Booth, A.B., Ed.M.
Associate Professor of Mathematics, Northeastern University.
Mathematics (1956)

Roland J. Boucher, B.A., M.S.
Research Physicist, Air Force Cambridge Research Lab.
Aviation Technology (1968)

James W. Bougioukas, B.S., P.E. (Mass.)
Principal Civil Engineer Mass. D.P.W.
Engineering (1971)

Kenneth E. Bourque, B.S., M.S.
Electrical Engineering Technology (1959)

Alan Bradshaw, B.S., M.S.
Chelmsford School System.
Mathematics (1966)

Eugene G. Branca, S.B., S.M.
Assistant Headmaster (Retired), Hyde Park High School.
Mathematics (1946)

Donald H. Breslow, S.B., M.S.
Director of Engineering, Measurement Systems Division, Itek Corp.
Electrical Engineering Technology (1959)

Alfred E. Bresnahan, B.S., M.A.
Chairman, Mathematics Dept., Lynn English High School.
Mathematics (1967)

Donald C. Brock, B.S., M.S.
Mathematics Instructor, Needham High School.
Mathematics (1965)

Bruno Brodfeld, B.S.C.E., P.E. (Mass., La.)
Assistant Engineering Manager, Stone & Webster Engineering Corporation.
Civil Engineering Technology (1965)

*Franklyn K. Brown, B.S.Ed., M.Ed.
Associate Professor, Graphic Science, Northeastern University.
Course Consultant for Engineering Graphics and Computation (1955)

William A. Brown, B.S.E.E., M.S.E.E., J.D.
Assistant Professor of Law, Suffolk University Law School.
Electrical Engineering Technology (1965)

Jeffrey L. Bruce, B.S., M.A.
Instructor, Dover-Sherborn Regional High School.
Mathematics (1969)

William O. Bruehl, B.S.
Associate Professor, Mechanical Engineering, Northeastern University (Retired).
Course Consultant for Mechanical Engineering Technology (1956)

*Morris H. Burakoff, B.S., P.E. (Mass.)
Department Chief, Western Electric Company.
Electrical Engineering Technology (1957)

George Burdick, A.B., P.E. (Mass.)
Hudson Institute, Hudson, Mass.
Electrical Engineering Technology (1950)

Ralph A. Buonopane, B.S., M.S., Ph.D.
Associate Professor of Chemical Engineering, Northeastern University.
Chemical Engineering Technology (1964)

Donald Burgess, A.B., M.Ed.
Acting Headmaster, Roslindale High School.
Mathematics (1967)

Steven Butcher, Jr., S.B., M.S.
Technical Staff, The Mitre Corporation.
Electrical Engineering Technology (1967)

Gregory J. Cahill
Engineer, Jackson Moreland.
Mechanical Engineering Technology (1968)

*Leroy M. Cahoon, B.S.C.E., M.S., P.E. (Mass.)
Associate Professor of Civil Engineering, Northeastern University.
Program Consultant for Civil Engineering Technology (1962)

John J. Callahan, B.S., M.Ed., M.A.
Assistant Professor, Boston State College.
Mathematics (1969)

*Frank R. Cangiano, B.S., Ed.M.
Instructor in Science and Mathematics, Medford High School.
Mathematics (1957)

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*Appointed to the rank of Senior Lecturer

Barry S. Canner
Wiggins Airways
Aviation Technology (1970)

Edgar T. Canty, B.S., M.S.
Director Academic Computing Services.
Mathematics (1966) Babson College

Chapin P. Carnes
Bedford Air Force Base.
Physics (1974)

Richard I. Carter, B.S., M.S., P.E. (Mass.)
Associate Professor, Electrical Engineering and Director of Computation Center, Northeastern University.
Engineering Graphics and Computation (1955)

William B. Carter
Programming Analyst, Polaroid Corporation.
Engineering Graphics and Computation (1974)

Walter J. Casey, A.B., M.Ed., M.A.T.
Head of Department, Brighton High School.
Mathematics (1955)

Walter J. Charow, B.S.E.E., M.S.E.E., P.E. (Mass.)
Branch Chief, Avionics, Electronics System Div., U.S.A.F.
Electrical Engineering Technology (1955)

Susan Chouinard
Editor, Benwill Publishing Corporation.
Technical Communications (1975)

Philip J. Clang, B.S., P.E. (Conn., Mass., Pa.)
Project Manager, United Engineers & Constructors, Inc.
Mechanical Engineering Technology (1957)

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Associate Professor of Civil Engineering, Northeastern University.
Civil Engineering Technology (1972)

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Advanced Research Engineer, G.T.E. Sylvania.
Engineering Graphics and Computation (1969)

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Engineer, United Engineering and Construction.
Mechanical Engineering Technology (1960)

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Physicist, New England Nuclear Co.
Physics (1974)

Leonard M. Conlin, A.B., Ed.M.
Mathematics Teacher, Framingham North High School.
Mathematics (1967)

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Physics (1965)

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Principal—Milton High School.
Mathematics (1953)

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Manager of Technology, Electronic Systems, Sylvania Electric Products, Inc.
Electrical Engineering Technology (1948)

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Professor of Mathematics, Northeastern University.
Program Consultant for Mathematics (1941)

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Principal Engineer, Raytheon Company.
Engineering Graphics and Computation (1967)

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WCVB-TV, Chief Meteorologist.
Aviation Technology (1968)

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Mathematics (1967)

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Professional Engineer, Technical Operations.
Mechanical Engineering Technology (1967)

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Reliability Engineer, Raytheon Corporation.
Graphics Instructor, Fitchburg State College.
Mechanical Engineering Technology (1969)

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New Product Center, Raytheon Company.
Mechanical Engineering Technology (1966)

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Structural Engineer, Charles T. Main, Inc.
Civil Engineering Technology (1972)

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Electrical Engineering Technology (1948)

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Professor of Mathematics, Northeastern University.
Course Consultant for Mathematics (1941)

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Consulting Editor, Medical Electronics & Data
President CTR, Inc., Adjutanct Professor at Indiana Northern University.
Electrical (1967)

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Mathematics (1965)

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Program Manager, Incoterm.
Engineering Graphics & Computation (1966)

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Mathematics (1964)

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Electrical Engineering Technology

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Mechanical Engineering Technology (1973)

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Electrical Engineering Technology (1970)

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Program Director, Avco Corporation.
Electrical Engineering Technology (1973)

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Associate Professor of Civil Engineering, Tufts University.
Civil Engineering Technology (1968)

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Academic Counsellor (1967)

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Head of Mathematics Dept., Boston Latin School.
Mathematics (1964)

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Engineer, General Electric Co.
Mechanical Engineering Technology (1967)

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Engineering Graphics and Computation (1957)

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Architect, Corp. of Engineers.
Engineering Graphics & Computation (1942)

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Engineering Graphics and Computation (1966)

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Educational Consultant, St. Anne's School.
Mathematics (1957)

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Dean, Cambridge High and Latin School.
Engineering Graphics and Computation (1966)

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Professor of Cooperative Education, Northeastern University.
Academic Counsellor (1967)

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Electrical Engineering (1972)

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Course Consultant for Mathematics (1946)

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Fire Technology (1973)

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Engineering Graphics and Computation (1956)

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Computation & Graphics (1969)

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Electrical Engineering (1962)

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Mechanical Engineering Technology (1957)

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Mathematics (1969)

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Course Consultant for Electrical Engineering Technology (1949)

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Physics (1965)

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Mechanical Engineering Technology (1973)

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Mathematics (1965)

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Physics (1967)

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Civil Engineering Technology (1969)

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Mechanical Engineering Technology (1969)

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Control Systems Engineering (1964)

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Engineering Graphics and Computation (1969)

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Electrical Engineering Technology (1974)

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Electrical Engineering Technology (1969)

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Mechanical Engineering Technology (1970)

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Electrical Engineering (1955)

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Mathematics 1963

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Course Consultant for Physics (1963)

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Course Consultant for Physics (1946)

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Electrical Engineering Technology (1962)

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Mathematics 1965

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Mathematics (1969)

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Mechanical Engineering Technology (1967)

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Mathematics (1967)

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Mechanical Engineering Technology (1967)

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Civil Engineering Technology (1950)

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Physics (1967)

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Mathematics (1965)

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Radiologic Technology and Commercial Aviation Technology (1968)

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Electrical Engineering Technology (1963)

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Electrical Engineering Technology (1970)

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Civil Engineering Technology (1963)

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Civil Engineering Technology (1959)

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Physics (1958)

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Mathematics (1967)

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Aviation Technology (1969)

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Mathematics (1957)

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Course Consultant for Materials

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Electrical Engineering Technology (1957)

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Mechanical Engineering Technology (1958)

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Manager, Day and Zimmerman Associates.
Mechanical Engineering Technology (1955)

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Civil Engineering Technology (1964)

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Electrical Engineering Technology (1950)

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Power Engineer, Stone & Webster Engineering Corp.
Mechanical Engineering Technology (1966)

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Research Engineer, Emeritus, General Radio Company.
Electrical Engineering Technology (1945)

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Manager of Employment and Training, Masoneilan International, Inc.
Engineering Graphics and Computation (1936)

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Program Consultant for Engineering Graphics and Computation (1955)

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Mathematics (1974)

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Mechanical and Electrical Engineering Senior Designer, Aircraft Gas Turbine Division, General Electric Company.
Engineering Graphics and Computation (1955)

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Quincy Public Schools.
Mathematics (1965)

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Consultant in Applied Mathematics and Computer Sciences.
Mathematics (1968)

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Teaching Assistant, Mechanical Engineering, Northeastern University.
Mechanical Engineering Technology (1973)

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Dept. Manager, Raytheon Co., Burlington, Mass.
Physics (1967)

Sandra M. Licter, B.S.Ed., M.Ed.
Instructor, Lynn English High School.
Mathematics (1967)

*Demetre P. Ligor, B.S.E.E., P.E. (Mass.)
President, Applied Measurements, Inc.
Course Consultant for Physics (1959)

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Senior Engineer, United Engineers and Constructors.
Civil Engineering (1972)

Warren J. Little, B.S., M.S.
Principal Engineer, Charles Stark Draper Laboratory, Inc.
Physics (1966)

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Design Engineer, Charles Stark Draper Laboratory, Inc.
Mechanical Engineering Technology (1946)

*Roger G. Long, A.E., B.B.A., P.E. (Mass.)
Senior Staff, Arthur D. Little, Inc.
Electrical Engineering Technology (1952)

Spencer P. Lookner, B.S.E.E., M.S.E.E., M.S.I.E.
Mathematics (1967)

*Kenneth A. Lucas, B.S., M.Ed., P.E. (Mass., Conn.), R.L.S. (Mass., Conn., Maine, N.H.)
Director, EMAPELS School of Survey.
Civil Engineering Technology (1950)

Norman J. MacDonald, B.S., M.S.
WBZ-TV Meteorologist.
Research Associate, Mass. Institute of Technology.
Aviation Technology (1974)

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Research Engineer, Raytheon Company.
Electrical Engineering Technology (1968)

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Program Management, Raytheon Missile Systems Division.
Electrical Engineering Technology (1950)

Jack I. Mann., B.S.C.E., M.S., P.E. (Mass., Conn., Pa., Vt., Wyoming)
Chief Engineer, General Engineering, United Eng. & Constr. Inc.
Mechanical Engineering Technology (1960)

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Air Force Cambridge Research Laboratory.
Electrical Engineering Technology (1973)

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Staff Member, Massachusetts Institute of Technology.
Electrical Engineering Technology (1969)

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Vice-Principal, Lynn Eastern Jr. High School.
Physics (1967)

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Engineer, Bell and Howell Comm. Co.
Electrical Engineering Technology (1951)

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Project Engineer, Howard, Needles, Tammen & Bergendorff.
Civil Engineering Technology (1960)

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Engineer, Department of Transportation.
Course Consultant for Engineering Graphics and Computation (1966)

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Manager, Flow Engineering Dept., The Foxboro Co.
Mechanical Engineering Technology (1959)

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Program Consultant for Mechanical Engineering Technology
Day and Evening Programs (1947)

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Technical Staff, Radio Corporation of America, Burlington, Mass.
Electrical Engineering Technology (1967)

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Teacher, Pentucket Regional High School.
Mathematics (1971)

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Civil Engineering Technology (1972)

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Civil Engineering Technology (1972)

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Program Consultant for Electrical Engineering
Day and Evening Programs (1973)

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Graphics & Computation (1967)

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Mathematics (1946)

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Mechanical Engineering Technology (1961)

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Mathematics (1967)

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Civil Engineering Technology (1970)

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Engineering Graphics and Computation (1964)

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Instructor in Mathematics, Quincy High School.
Mathematics (1952)

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Mechanical Engineering Technology (1963)

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Electrical Engineering Technology (1952)

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Radiochemist, New England Nuclear Corporation.
Physics (1968)

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Mathematics (1967)

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Mechanical Engineering Technology (1966)

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Electrical Engineering Technology (1966)

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Electrical Engineering Technology (1970)

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Mathematics (1967)

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Electrical Engineering Technology (1960)

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Aviation Technology (1972)

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Electrical Engineering Technology (1954)

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Ratcliffe Marine Design.
Electrical Engineering Technology (1955)

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Course Consultant for Physics (1965)

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Civil Engineering Technology (1972)

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Mechanical Engineering Technology (1956)

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Mathematics (1964)

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Mechanical Engineering Technology (1967)

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Mathematics (1967)

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Physics (1967)

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Mathematics (1959)

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Mathematics (1958)

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Mathematics (1965)

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Mathematics (1970)

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Associate Architect, Childs, Bertman, Tseckares Assoc. Inc.
Civil Engineering Technology (1974)

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Physics (1958)

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Electrical Engineering Technology (1967)

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Mechanical Engineering Technology (1966)

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Course Consultant for Electrical Engineering Technology (1955)

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Engineering Graphics and Computation (1967)

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Mathematics (1966)

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Mathematics (1968)

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Instructor of Mathematics, Needham Senior High School.
Mathematics (1967)

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Mechanical Engineering Technology (1970)

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Mathematics (1959)

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Academic Counsellor (1969)

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Mechanical Engineering Technology (1955)

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Academic Counsellor (1967)

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Engineering Graphics and Computation (1966)

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Civil Engineering Technology (1965)

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Electrical Engineering Technology (1960)

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Physics (1967)

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Electrical Engineering Technology (1962)

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Mechanical Engineering Technology (1969)

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Physics (1961)

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Physics (1968)

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Mathematics (1966)

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Mathematics (1956)

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Physics (1960)

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Mechanical Engineering Technology (1968)

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Electrical Engineering Technology (1965)

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Physics (1968)

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Physics (1968)

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Mathematics (1955)

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Mathematics (1944)

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Research & Development Engineer, Inertial Guidance, Raytheon Company.
Mechanical Engineering Technology (1968)

*Thomas F. White, B.S., B.S.M.E.E., M.Ed., M.A.
Coordinator of Mathematics K-14, Quincy Public Schools.
Mathematics (1957)

---

*Appointed to the rank of Senior Lecturer

*Willard B. Whittemore, B.S., in C.E., Ed.M., C.A.G.S.
Director of Mathematics, Everett Public Schools (Retired).
Course Consultant for Mathematics (1957)

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Civil Engineering Technology (1949)

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Staff, Massachusetts Institute of Technology, Lincoln Laboratory.
Physics (1961)

*Albert G. Wilson, Jr., B.S., M.S., P.E. (Mass.), S.E. (Ill.)
Member Gilbert Small & Company, Consulting Engineers.
Course Consultant for Mechanical Engineering Technology (1948)

Kenneth S. Woodward, B.S., M.E.
Associate Professor, Graphic Science, Northeastern University.
Director, Aviation Technology-Lincoln College.
Academic Counsellor (1967)

Elliot Wyner, B.S., M.S., Ph.D.
Physicist, United States Army Natick Laboratory.
Physics (1973)

Walter Zagieboylo, M.S., M.E., P.E. (Mass.)
Research Engineer, U.S. Army Natick Labs.
Mathematics (1969)

Walter P. Zanor, B.S.B.A.
Instructor, Everett High School.
Mathematics (1967)

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Lincoln College
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☐ Will you please arrange for me to have an interview to discuss your program in _____

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_____
Signature

_____
Street Address

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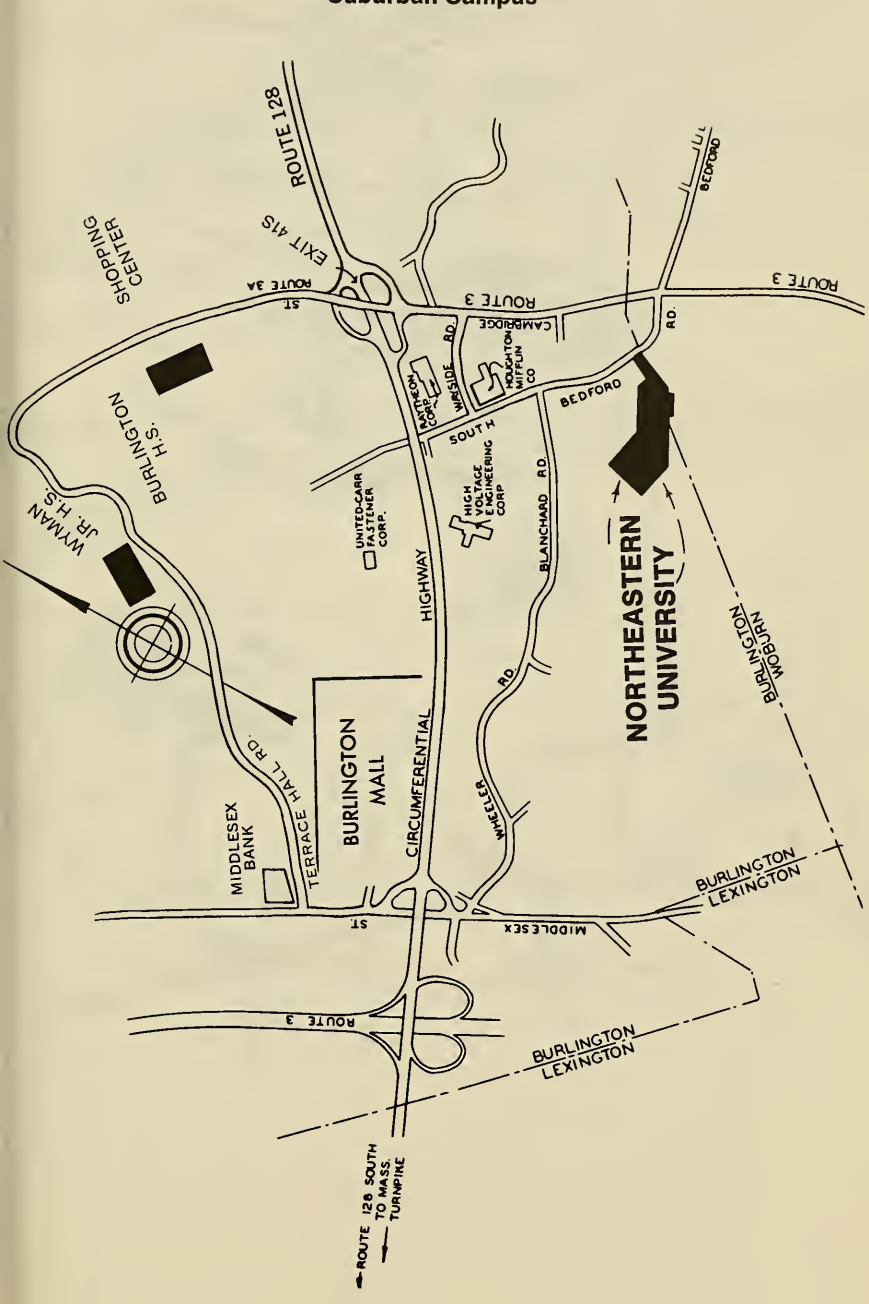
City State Zip Code

suburban maps



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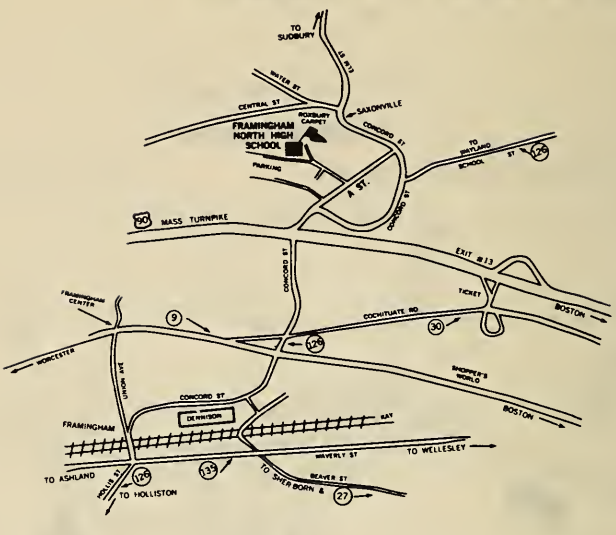
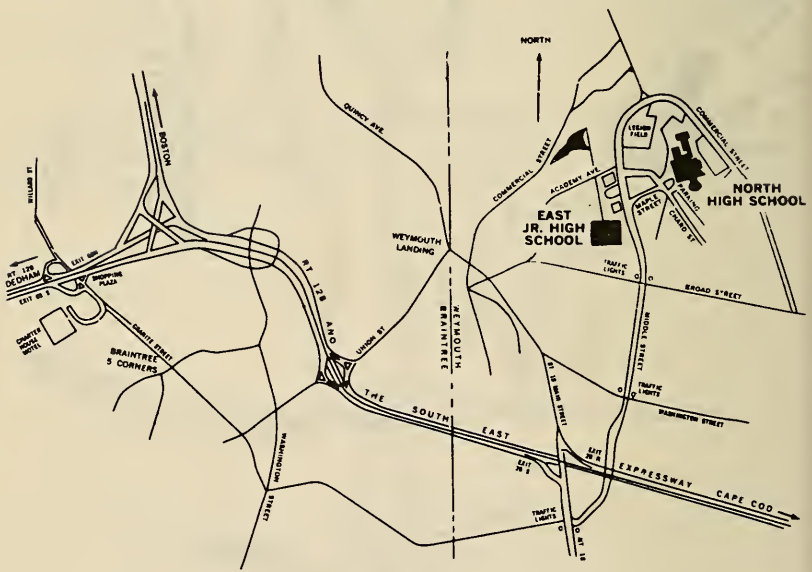
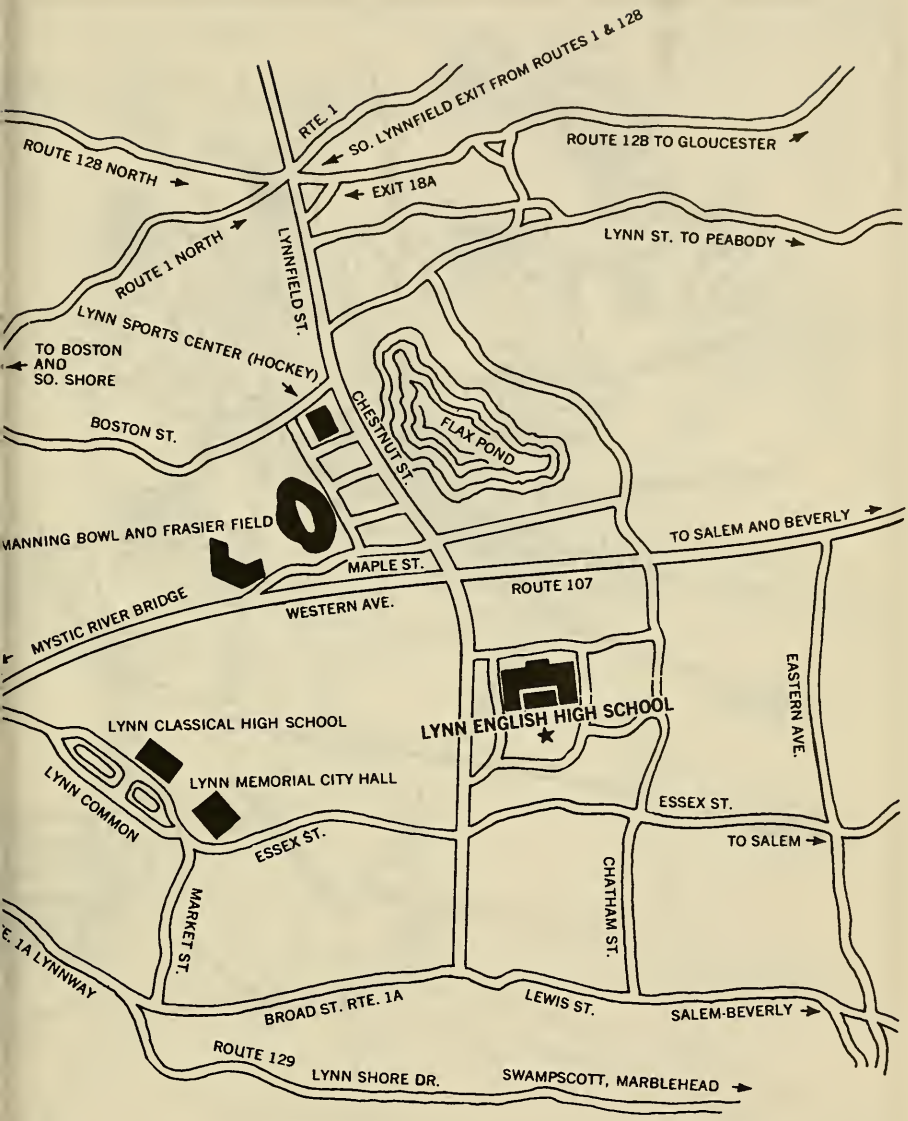


Weymouth Schools



Lynn English High School



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WINTER ST.
PLAYGROUND
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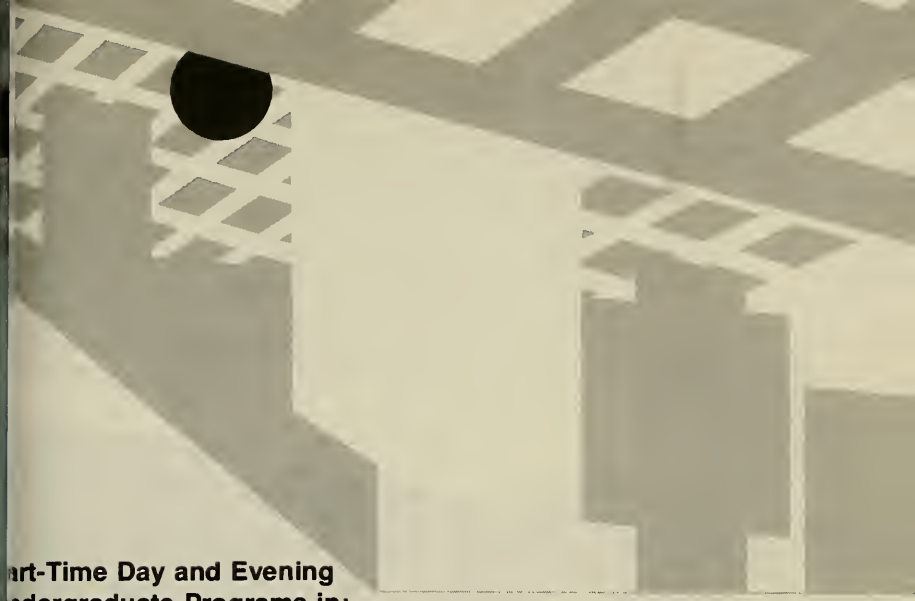
August Issue

NORTHEASTERN UNIVERSITY 1975-77
UNIVERSITY COLLEGE



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e Northeastern University Bulletin is issued at 360 Huntington Avenue, Boston, Massachusetts 02115, eight times a year: once in January, twice in August, once in September, ce in October, twice in November and once in December. Second Class Postage paid at oston, Massachusetts. Volume III, Number 2, August 1, 1975.

NORTHEASTERN UNIVERSITY 1975-77
UNIVERSITY COLLEGE

NORTHEASTE UNIVERSIT

The University College Bulletin is a document of record issued in August, 1975, for two years. Addenda to this bulletin will be published in August, 1976.

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MAP REFERENCE	Building	Building Designation
F6	Barletta Natatorium	BN
F10	Botolph Building	BT
E6	Cabot Physical Education Ctr.	CB
G7	Churchill Hall	CH
A6	Cushing Hall	CU
H6	Dana Research Center	DA
F5	Dockser Hall	DK
E9	Dodge Library	DG
G8	Ell Student Center and	EC
F8	Alumni Auditorium	EL
G6	Forsyth Building	FR
G5	Forsyth Building Annex	FA
F4	Greenleaf Building	GR
F7	Hayden Hall	HA
G10	Hurtig Hall	HT
B6	Cahners Hall	CA
E4	Knowles Center (Volpe)	KV
E4	Knowles Center (Gryzmish)	KG
J3	11 Leon Street	UO
H3	African-American Institute	AF
F9	Mugar Life Sciences Building	MU
F3	Parker Building	PA
E7	Richards Hall	RI
H9	Robinson Hall	RB
G5	United Realty Building	UR

UNIVERSITY COLLEGE OFFICES

Office for General Information	102 Churchill Hall	437-2400
Office of the Registrar	120 Hayden Hall	437-2300
Burlington Campus		272-5500

Regular Office Hours

Boston		
(120 HA & 102 CH)	Monday–Friday	8:30 a.m.–8:30 p.m.
(102 CH)	Saturday	8:30 a.m.–1:00 p.m.
Burlington (Suburban Campus)	Monday–Friday	8:00 a.m.–10:00 p.m.
	Saturday	8:00 a.m.–1:00 p.m.
Framingham North High School	Monday–Thursday	5:30–9:30 p.m.
Lynn English High School	Monday & Wednesday	5:30–9:30 p.m.
Haverhill High School	Monday–Tuesday	5:30–9:30 p.m.
Norwood Junior High North	Monday–Wednesday	5:30–9:30 p.m.
Weymouth High Schools	Monday–Thursday	5:30–9:30 p.m.
Boxford (Masconomet)	Tuesday	5:30–9:30 p.m.
Milford High School	Monday–Tuesday	5:30–9:30 p.m.
Revere High School	Tuesday & Thursday	5:30–9:30 p.m.

Summer Office Hours

Boston		
102 Churchill Hall	Monday–Thursday	8:30 a.m.–8:30 p.m.
	Friday	8:30 a.m.–4:30 p.m.
	Saturday	Closed
120 Hayden Hall	Monday–Thursday	8:30 a.m.–8:30 p.m.
	Friday	8:30 a.m.–4:30 p.m.
Burlington	Monday–Friday	8:00 a.m.–10:00 p.m.
	Saturday	Closed

1975–1976 ACADEMIC CALENDAR

Fall Quarter 1975

Classes Begin Monday, September 29, 1975

FALL REGISTRATION DATES

Boston	5:30–8:00 p.m.	Monday–Friday, September 8–12
Boston	9:00 a.m.–12 noon	Saturday, September 13
Boston	5:30–8:00 p.m.	Monday–Thursday, September 15–18
Burlington	5:30–8:00 p.m.	Monday–Thursday, September 15–18
Burlington	12 noon–8:00 p.m.	Tuesday, September 16
Boxford (Masconomet) Framingham North H. S. Haverhill H. S. Lynn English H. S. Norwood Jr. H. S. North Revere H. S. Weymouth North H. S.	5:30–8:00 p.m.	Tuesday, September 9 and Monday, September 15
Milford H. S.	5:30–8:00 p.m.	Monday, September 8 and Monday, September 15
Fall Quarter Classes Begin		Monday, September 29
Columbus Day Observed	No Classes	Monday, October 13
Veterans' Day Observed	No Classes	Tuesday, November 11
Thanksgiving Recess	No Classes	Thursday–Saturday, November 27–29
Final Examination Period For Fall Quarter		Monday, December 15–Saturday, December 20

Winter Quarter 1975–1976

Classes Begin Monday, January 5, 1976

WINTER REGISTRATION DATES

Boston	5:30–8:00 p.m.	Monday–Friday, December 8–12
Boxford (Masconomet)	5:30–8:00 p.m.	Tuesday, December 9
Burlington	5:30–8:00 p.m.	Monday–Thursday, December 8–11
Framingham North H. S.	5:30–8:00 p.m.	Monday–Thursday, December 8–11
Haverhill H. S.	5:30–8:00 p.m.	Monday and Tuesday, December 8–9
Lynn English H. S.	5:30–8:00 p.m.	Monday and Wednesday, December 8 and 10
Milford H. S.	5:30–8:00 p.m.	Monday and Tuesday, December 8–9
Norwood Jr. H. S. North	5:30–8:00 p.m.	Monday–Wednesday, December 8–10
Revere H. S.	5:30–8:00 p.m.	Tuesday and Thursday, December 9 and 11
Weymouth North H. S.	5:30–8:00 p.m.	Monday–Thursday, December 8–11
Christmas Vacation	No Classes	Monday, December 22–Saturday, January 3

Winter Quarter Classes Begin		Monday, January 5
Martin Luther King Day Observed	No Classes	Thursday, January 15
Washington's Birthday Observed	No Classes	Monday, February 16
Final Examination Period for Winter Quarter		Monday, March 22–Saturday, March 27

Spring Quarter 1976 Classes Begin Monday, April 5, 1976

SPRING REGISTRATION DATES

Boston	5:30–8:00 p.m.	Monday–Friday, March 15–19
Boxford (Masconomet)	5:30–8:00 p.m.	Tuesday, March 16
Burlington	5:30–8:00 p.m.	Monday–Thursday, March 15–18
Framingham North H. S.	5:30–8:00 p.m.	Monday–Thursday, March 15–18
Haverhill H. S.	5:30–8:00 p.m.	Monday and Tuesday, March 15 and 16
Lynn English H. S.	5:30–8:00 p.m.	Monday and Wednesday, March 15 and 17
Milford H. S.	5:30–8:00 p.m.	Monday and Tuesday, March 15 and 16
Norwood Jr. H. S. North	5:30–8:00 p.m.	Monday–Wednesday, March 15–17
Revere H. S.	5:30–8:00 p.m.	Tuesday and Thursday, March 16 and 18
Weymouth North H. S.	5:30–8:00 p.m.	Monday–Thursday, March 15–18
Spring Recess (or Make-Up Period for Lost Snow Days)		Monday, March 29–Saturday, April 3
Spring Quarter Classes Begin		Monday, April 5
Patriot's Day Observed	No Classes	Monday, April 19
Memorial Day Observed	No Classes	Monday, May 31
Final Examination Period for Spring Quarter		Tuesday, June 14–Monday, June 19
Commencement		Sunday, June 20

Summer Quarter 1976 Classes Begin Monday, June 28, 1976

REGISTRATION FOR ENTIRE SUMMER QUARTER

Boston	5:30–8:00 p.m.	Monday–Friday, June 7–11
Burlington	12 noon–8:00 p.m.	Tuesday, June 8
Summer Quarter Classes Begin		Monday, June 28

REGISTRATION FOR SECOND SIX-WEEK TERM

Boston	5:30–8:00 p.m.	Monday and Tuesday, July 26 and 27
Burlington	5:30–8:00 p.m.	Monday, July 26
Independence Day Observed	No Classes	Monday, July 5
Labor Day Observed	No Classes	Monday, September 6
Final Examination Period for Summer Quarter		Monday, September 13–Thursday, September 18

Program Advisers

Program advisers are available each day and evening by appointment in the University College Office. They are competent to assist the student in planning a program suitable to his general educational and career objectives. They can also answer questions relating to degree requirements, course sequence, and proper scheduling of courses. Appointments may be arranged by calling the University College Office (437-2400) or by coming in person to 102 Churchill Hall. There is no charge for this service.

Program advisers are also available during registration at all registration sites. No appointment is necessary.

Counseling and Testing Center

Counseling and testing to aid a student or prospective student with career, educational, or personal concerns are available days and certain weekday evenings until 8:30 p.m. Information regarding fees and appointments may be obtained by calling 437-2142, or by going to the Counseling and Testing Center, 302 Ell Student Center.

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admission, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or physical or mental handicap.

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Malcolm J. Campbell, B.A., M.Ed., *Associate Dean of Adult Education and Director of the Center for Continuing Education*

Richard I. Carter, B.S., M.S., *Director of the Computation Center*

Geoffrey Crofts, B.Comm., *Dean and Director of the Graduate School of Actuarial Science*

John A. Curry, A.B., Ed.M., *Dean of Academic Services, Assistant to the Executive Vice President, and Acting Dean of Admissions*

Charles M. Devlin, B.S., M.Ed., *Assistant to the Vice President for Finance (Financial Aid Office)*

Ann M. Duncan-Glasgow, A.B., Ed.M., Ph.D., *Director of Affirmative Action*

Martin W. Essigmann, S.B., M.S., *Dean of Research*

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Joseph M. Golemme, S.B., M.A., C.P.A., *Director of the Graduate School of Professional Accounting*

George W. Hankinson, A.B., B.S., M.S., *Director of the Graduate School of Engineering and Assistant Dean of Engineering*

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Sidney Herman, A.B., M.A., *Associate Dean of Faculty*

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Helene A. Loux, B.S., Ph.D., *Associate Dean of Allied Health Professions*

Alan A. Mackey, B.S., A.M., *University Registrar*

Melvin Mark, B.S., M.S., Sc.D., *Dean of Engineering*

Frank E. Marsh, Jr., A.B., M.Ed., D.Ed., *Dean of Education*

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Harold Naidus, A.B., M.S., Ph.D., *Associate Dean of University College and Director of Liberal Arts Programs*

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Paul M. Pratt, B.S., M.Ed., *Dean of the Department of Cooperative Education*

Gregory T. Ricks, B.A., M.C.P., *Director of the African-American Institute and Assistant Dean of Students*

Nathan Riser, A.B., A.M., Ph.D., *Director of Marine Science Institute*

Norman Rosenblatt, A.B., Ph.D., *Dean of Criminal Justice and Director of the Graduate Program of Criminal Justice*

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Donald Taylor, B.A., M.Ed., *Business Manager*

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Paul J. McInerney, B.S., *Assistant Registrar*
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Florence Tunder, *Administrative Assistant*
Ralph T. Vernile, Jr., B.S., *Assistant Dean and Director of Administrative Services*
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Sidney Herman
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Raymond H. Robinson
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Three Students
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Paul Cowan
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Barbara Schulze
Two Students

the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. By special enactment, the State Legislature has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which comprises more than 178 distinguished business and professional men and women.

From its beginning Northeastern University's dominant purpose has been to identify community educational needs and to meet these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has pioneered new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, under which students alternate periods of work and study. The Plan was initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922); Liberal Arts (1935); Education (1953); Pharmacy (1962); Nursing (1964); Boston-Bouvé College (1964); the College of Criminal Justice (1967); and by Lincoln College's daytime Bachelor of Engineering Technology program (1971).

This time-tested method of education offers students the opportunity to gain valuable practical experience as an integral part of their college programs and also enables them to contribute substantially to the financing of their education. The "Co-op" Plan has been extended to the graduate level in engineering, actuarial science, professional accounting, business administration, rehabilitation administration, and law.

In the field of adult education, Northeastern University offers graduate and undergraduate degree programs and non-credit programs which are specifically designed to meet the needs and interests of adults who wish to further their education on a part-time basis.

All formal courses of study leading to degrees in the Graduate Division, Lincoln College, and University College are approved by the undergraduate faculties concerned, and are governed by the same qualitative and quantitative standards as the regular day curricula. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and at other off-campus locations near Boston.

UNDERGRADUATE COLLEGES

Boston-Bouvé College

Boston-Bouvé College offers four major programs of study: physical education, recreation education, and health education, leading to the degree of Bachelor of Science in Education; and physical therapy, leading to the degree of Bachelor of Science in Physical Therapy.

The combined programs of liberal arts, science, and professional preparation include field experience and student teaching as well as leadership training in camping and outdoor education at the Warren Center for Physical Education and Recreation in Ashland. In accordance with Northeastern's Cooperative Plan of Education, students are offered varied opportunities for alternate terms of work-study experience during upper-class years.

College of Business Administration

The College of Business Administration offers programs of study in the principal fields of business leading to the Bachelor of Science degree in Business Administration. These programs are offered on the five-year Co-operative Plan, under which students gain substantial practical experience as an integral part of their undergraduate course of study.

The College also sponsors a Center for Management Development, which annually conducts an intensive program designed to provide professional growth for middle management executives. The plan of instruction, based on a modification of the Northeastern Cooperative Program, permits the participants to maintain their job responsibilities during the six-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Andover Academy.

The Bureau of Business and Economic Research, concerned particularly with problems of the New England region, is an integral part of the College. The Bureau conducts research projects under faculty leadership using undergraduate cooperative students as research assistants.

College of Criminal Justice

The College of Criminal Justice offers a full-time day curricula on the Cooperative Plan leading to the degree of Bachelor of Science.

College of Education

The College of Education offers programs leading to the degree of Bachelor of Science in Education. These are designed to prepare stu-

dents for teaching or administrative positions in elementary and secondary schools. Curricula are offered on the five-year Cooperative Plan, which provides employment in libraries, social service agencies, and school systems.

College of Engineering

The College of Engineering offers five-year cooperative curricula in civil, mechanical, electrical, chemical, and industrial engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies, and a more general program without specification leading to the Bachelor of Science degree. A six-year program in power systems engineering in collaboration with public utilities leads to both the bachelor's and master's degree in electrical engineering. The College also offers during evening hours part-time programs leading to Bachelor of Science degrees in Civil and Electrical Engineering. These programs extend over eight years, cover the identical courses given in the day cooperative curricula, and meet the same qualitative and quantitative standards of scholarship.

College of Liberal Arts

The College of Liberal Arts offers majors in the arts and sciences leading to the Bachelor of Arts or Bachelor of Science degrees. With the exceptions of preprofessional programs, curricula are normally five years in length and operate on the Cooperative Plan.

Lincoln College

Lincoln College offers engineering technology programs leading to the degrees of Associate in Engineering, Associate in Science, and Bachelor of Engineering Technology. These programs are made available as:

(a) A full-time day curricula on the Cooperative Plan leading to the degree of Bachelor of Engineering Technology (B.E.T.) in Mechanical and Electrical Engineering.

(b) A part-time evening program including pre-technology preparatory courses and degree programs leading to the Associate in Engineering (A.E.); and the Bachelor of Engineering Technology (B.E.T.) in Civil, Mechanical, and Electrical Engineering. The Associate in Science degree may be earned in the mathematical, physical, and chemical sciences.

The day B.E.T. program is designed to meet the needs of the high school graduate or the student transferring from a community college or technical institute and who desires the full time day curricula on the Northeastern Cooperative Plan.

In addition to its traditional curricula, Lincoln College Evening School offers interdisciplinary and certificate programs providing technological and professional development opportunities to meet special needs of the part-time student. These programs are designed to provide trained people for ready assimilation by the engineering field and to prepare students for the challenge of interfacing technology and society.

Recognizing the increasing need for higher levels of technical efficiency in firefighters, Lincoln College, in collaboration with local firefighting agencies, has designed a part-time evening program leading to an Associate in Science degree in Fire Technology. The curriculum includes a broad spectrum of those science technologies which are basic in coping with the fire fighting problems attendant to the complexities of today's society.

College of Nursing

The College of Nursing offers two separate and distinct programs of study, both organized on the Cooperative Plan:

(a) A three-year curriculum in preparation for the R.N. Examinations, and leading to the Associate in Science degree.

(b) A five-year curriculum in preparation for the R.N. Examinations, and leading to the Bachelor of Science degree in Nursing.

Five of Boston's leading hospitals—Beth Israel, Children's Hospital Medical Center, New England Deaconess, Peter Bent Brigham, and Massachusetts General—collaborate with Northeastern by providing suitable cooperative work opportunities during the students' upperclass years in these programs.

College of Pharmacy and Allied Health Professions

The College of Pharmacy and Allied Health Professions offers five-year cooperative curricula leading to the degree of Bachelor of Science in Pharmacy, and to the Bachelor of Science degree with majors in medical laboratory science (medical technology, cytotechnology, and hematology) medical record administration, and management in health care agencies and institutions. Associate degree programs are offered in medical laboratory science, respiratory therapy, dental hygiene, and cytotechnology. The College has academic responsibility and, in cooperation with the medical schools and teaching hospitals in the Boston area, offers the professional program for physician assistants.

University College

University College, so called because it draws upon the resources of the other colleges of the University, offers part-time day and evening

programs in liberal arts, business administration, law enforcement, education, health professions, and therapeutic recreation service programs, leading to the Associate in Science, Bachelor of Arts, and Bachelor of Science degrees. It does not duplicate the offerings of the day colleges, but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adult students. Students may pursue a degree or simply take courses, based on needs and interests, up to a total of forty quarter hours of credit. Courses are offered in Boston as well as in Boxford, Burlington, Framingham, Lynn, Haverhill, Milford, Revere, Weymouth, and several other convenient locations.

Adult Day Programs refers to University College courses that are offered Monday through Friday, 9:00 a.m. to 5:00 p.m., to meet the needs of adults with family or other obligations who wish to engage in part-time study during the day. In addition to the daytime offering of regular University College credit courses, Adult Day Programs also offers daytime workshops and conferences, sometimes over weekends, with the option for credit. Adult Day Programs are offered primarily on the Boston and Burlington campuses, with a limited number of courses offered at other off-campus locations.

Students may enroll as degree candidates or elect single courses appropriate to their needs and interests. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and other off-campus locations near Boston.

GRADUATE SCHOOLS

Actuarial Science
Master of Science in Actuarial Science.

Arts and Sciences
The Master of Arts degree may be earned in economics, English, history, political science, psychology, sociology, and social anthropology. The Master of Science degree is available in biology, chemistry, mathematics, and physics. The Master of Science in Health Science and the Master of Public Administration degrees are also offered. In addition, there are programs leading to the Doctor of Philosophy Degree in biology, chemistry, economics, mathematics, physics, psychology, and sociology.

Boston-Bouvé College
Master of Science in Physical Education and Master of Science in Recreation Education.

Business Administration
Master of Business Administration.

Criminal Justice
Master of Science in Criminal Justice.

Education
Master of Education, and the Certificate of Advanced Graduate Study.

Engineering
Master of Science with course specification, including a special six-year program in Power Systems Engineering leading to both bachelor's and master's degrees in Electrical Engineering; a similar six-year program in Mechanical Engineering leading to both bachelor's and master's degrees; the Master of Science degree in Civil Engineering; master's degrees in the fields of Industrial Engineering and Engineering Management; the professional Engineer degree in Electrical Engineering; the Ph.D. in the fields of Electrical, Chemical, Civil, and Mechanical Engineering; and Doctor of Engineering degree in Chemical Engineering. In addition, the intermediate degree of Engineer is offered.

Law
The School of Law offers a full-time program of professional instruction leading to the degree of Juris Doctor (J.D.) The three-year curriculum includes twelve months of experience in law offices. There are no courses for part-time or evening students.

Pharmacy and Allied Health Professions
Master of Science with specialization in Hospital Pharmacy, Industrial Pharmacy, Medicinal Chemistry, Pharmacology, Medical Laboratory Science, and Doctor of Philosophy in Medicinal Chemistry.

Professional Accounting
A five-quarter curriculum leading to the degree of Master of Science in Accounting.

INSURANCE INSTITUTE

The Insurance Institute, part of University College, is sponsored by local insurance organizations and companies. It offers a number of non-credit courses in preparation for the Chartered Life Underwriter and Chartered Property-Casualty Underwriter Designations as well as for the General Insurance, Insurance Adjuster, and Risk Management Certificates. (437-2506).

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve

specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers several programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

RESEARCH ACTIVITIES

The faculties of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

buildings and facilities

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 47 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

Carl S. Ell Student Center

The Carl S. Ell Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

The University Library

The Dodge Library is the main library on the Boston campus and maintains an open-stack system. Bound volumes in the library system exceed 360,000, and microfilm titles, 267,000. Collections are located in these areas:

1. The General Collection in the book stacks as indicated by the classification number given in the upper left corner of the catalog card.
2. The Reference Collection in the Cabot Reading Room to the left of the Circulation Desk, which includes bibliographies, maps, company publications, the pamphlet file, and association publications. Theses, under the supervision of the Reference Dept., housed in the basement, and available on request in the Reference Room.
3. The Periodical Collection in the Webster Reading Room to the right of the circulation desk, consisting of current periodicals, periodical indexes, and abstracts, with two adjacent stack levels for back files of bound volumes. The Microfilm Collection in room 108, adjacent to the Webster Reading Room.
4. The Reserve Book Collection on the second floor.
5. The Foreign Literature Collections in the Webster Reading Room to the right of the Circulation Desk.
6. The Collections of Fine Arts, housed in the Richardson Room on the second floor. The Audio Facility for spoken and music recordings and magnetic tapes for instructional and individual use also located in this room.
7. The American and English Literature Collections in the Literature Reading Room.
8. Government Documents maintained on the basement level.

The Card Catalog is a union list of materials in the University libraries and is located in the Webster Reading Room. There are also book catalogs of the collections in the Math/Psych Library, Chemistry Building Library, Documents and Reserve Rooms. There is an Information Desk in this room to assist people in using the card catalog during the day.

The Circulation Dept. has a printed list of all materials charged out, which may be consulted by all users. To borrow materials, University identification must be presented. For extensive research, where the University Library does not have the material, application should be made to the Inter-Library Loan Librarian for materials needed from other libraries. Information service is available in this department in the evenings.

Library Hours — Boston Campus

Monday — Thursday	7:45 a.m. to 10:00 p.m.
Friday	7:45 a.m. to 7:30 p.m.
Saturday & Sunday	1:00 p.m. to 5:00 p.m.

The University Library System includes three graduate libraries in the Division of Research. Physics-Electrical Engineering is housed in 325

Dana Research Center. Mathematics-Psychology is housed on the fifth floor of the United Realty Building and Chemistry is located on the first floor of Hurtig Hall.

Library Hours — Suburban Campus, Burlington

Monday — Friday 8:30 a.m. to 9:00 p.m.

Cabot Physical Education Center

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. It contains four basketball courts, an athletic cage, a women's gymnasium, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouvé College.

A recent addition to the center, the Barletta Natatorium, houses a 105-foot swimming pool, a practice tank for the crew, handball courts, and shower and dressing facilities.

Dockser Hall

Charles and Estelle Dockser Hall, completed in 1968, houses a large gymnasium, dance studio, motor performance laboratory, college library, community recreation laboratory, folk arts center, dark and music rooms, recreation resources area, locker rooms, offices, classrooms, conference room and lounge, storage facilities, and a research laboratory.

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, business administration, education, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and non-credit state-of-the-art programs are offered.

Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

Warren Center

The Warren Center for Physical Education and Recreation in Ashlanc Massachusetts, serves as a year-round outdoor laboratory for student in Boston-Bouvé College. There are facilities for conferences, specia education in arts and crafts, and sports — including aquatics. Builc ings include a lodge, cottages, and an infirmary.

Marine Science Institute

The Marine Science Institute at Nahant, Massachusetts, about 20 mile northeast of Boston, is a research and instructional facility primaril engaged in studies of marine biology and oceanography. The Institut is operated the year around.

Brockton, Nashua, and Framingham Campuses

For students residing in southeastern Massachusetts and northeaster Rhode Island, the Graduate School of Business Administration offers major portion of its M.B.A. Program at facilities in Brockton, Massa chusetts. These facilities, made available by the Veterans Administra tion Hospital, are conveniently located just off Route 24.

Students residing in the southern New Hampshire area may take major portion of the M.B.A. Program at facilities in Nashua, Ne Hampshire. These facilities are furnished by Sanders Associates, Inc and are located in their headquarters on Route 3, just over the Massa chusetts line.

For students in the Framingham-Worcester area, a major portion c the M.B.A. Program may be taken at classroom facilities located i Framingham, Massachusetts.

university college

he Programs

niversity College is committed to the education of mature, adult stu-ents who wish to live effectively in today's complex society. The pro-rams in University College are specifically designed to satisfy the nanging professional, cultural, and social needs and interests of dults.

egree programs have been developed in 39 major fields of study in e areas of business administration, education, liberal arts, law en-rcement, therapeutic recreation, and health-related programs. Flexi-e curricula are offered on a part-time basis Monday through Saturday uring day and evening hours convenient to adult students. Students ay elect single courses or may enroll in full degree programs leading the Associate in Science or the Bachelor's degree. Short-term sem-ars are also offered for credit. Classes are scheduled in locations nich are accessible to the urban and the suburban community. Stu-nts may attend classes at the Huntington Avenue Campus, Boston, the Suburban Campus, Burlington, Massachusetts, as well as other f-campus locations north, south, and west of Boston.

niversity College programs are constantly evaluated and redesigned nen necessary in order to keep pace with the changing needs and erests of its students and the community.

e Faculty

proximately 850 men and women comprise the part-time teaching ff of University College. Included are members of the full-time fac-y of the Basic Colleges of Northeastern University and other educa-nal institutions in New England, as well as outstanding New England siness and professional leaders with backgrounds of training and perience in specialized areas. The faculty are selected because y are highly successful in their fields and are well qualified to pro-e sound methods of teaching for adults in an interesting, inspiring, d effective manner.

The Student Body

The student body of University College represents diversified interests which, properly recognized and utilized, become one of the basic strengths in adult education. There are approximately 12,000 students in University College who range in age from 18 years to beyond retirement. While some students enroll in University College immediately after high school graduation, others may have graduated 25 years prior to enrollment in college-level courses.

University College students are men and women who have full-time commitments to their jobs, families, or other responsibilities. They may enroll in a single course or in a full degree curriculum, depending on whether their goal is job advancement, a new career, or personal enrichment.

academic policies

Admission

All applicants who satisfy the requirements as regular or special students are admitted as part-time students in University College. It is advisable for students to have an interview with an admissions counselor to help plan their academic program in University College, particularly in cases where previous credit has been completed at other institutions, in order to avoid possible duplication of courses. Because of the diversity of the student body in terms of background, age, interests, needs, etc., there are no entrance examinations and college board examination scores are not required. In lieu of entrance examinations, students must maintain a C average in order to be admitted to degree candidacy.

Regular Students

To be enrolled as a regular student, that is, to become a degree candidate, the applicant must have completed an approved secondary school course or the equivalent 15 units* of a high school diploma. Equivalency certificates are accepted. Regular students are those students who expect to follow a degree program.

Special Students

Special students are those students who do not wish to enroll in a full degree program, but are interested in taking only one or more courses appropriate to their needs or interests. Credits for these courses may be transferred to a degree program if the student desires to pursue a degree at a later time.

Procedure for Admission As a Degree Candidate: Matriculation

Petition forms for admission to the status of a degree candidate are available at offices on all University College Campuses. There are two methods of matriculation:

*A unit represents a year's work in any subject in any approved secondary school constituting approximately a quarter of a full year's work, or the equivalent. A four-year day high school course is regarded as representing at least 15 units of work, or 3 units in junior high school and 12 units in a three-year high school.

A. Standard Method of Matriculation
   1. If a student has completed 40 quarter hours of credit in University College, he cannot register for additional courses unless he has been officially accepted as a degree candidate.
   2. In order to matriculate as a degree candidate, the student must have a high school diploma or its equivalent and must achieve a cumulative quality point average of 2.00 (an average grade of C) for all courses completed before filing the petition. In the Liberal Arts Program, the 8 quarter hours of required English must be completed prior to matriculation.

B. Optional Method of Matriculation by Transfer Students
   1. If a student has successfully completed an associate degree program at another accredited institution, he may file for matriculation following one quarter in residence in University College.
   2. If a student has completed 40 quarter hours at another accredited institution, he may file for matriculation following one quarter in residence in University College.
   3. If a student has completed 40 quarter hours of combined credit from another accredited institution and University College, he may file for matriculation.

All students who file for matriculation must have a high school diploma or its equivalent, a cumulative quality point average of 2.00, and, if in the Liberal Arts Program, 8 quarter hours of required English.

A student who matriculates via Method B, is required to obtain written permission from his Program Director before taking courses in another institution subsequent to matriculation in University College.

The Committee on Academic Standing may require a student to take one or more aptitude or interest tests if his credentials or academic record fail to give evidence of probable academic success. In this case, the student will be notified in writing that arrangements for testing should be made by him with the University Counseling and Testing Center. A fee is charged for administering these tests.

Advanced Standing Credit

After completion of matriculation requirements in University College (40 quarter hours) Advanced Standing Credit may be obtained in two ways:

By Transfer of Credit from Another Institution

Subject to approval by the Director of Admissions, credit may be granted for work completed in other approved schools, colleges, or universities. An applicant who wishes to receive credit by transfer

should petition for transfer credit with the Director of Admissions. He should then write to the Registrar of the institution previously attended and request that an official transcript be sent to the Director of Admissions in University College. The transcript indicates honorable dismissal, courses completed, credits and grades received. The transcript should be sent well in advance of the registration period. A petition for transfer credit must be filed with the Director of Admissions to facilitate proper identification and processing of transfer credit.

Students who anticipate taking courses at other Colleges or Universities while enrolled in University College must secure permission in advance from the appropriate program director in University College.

Students who have been dismissed from another institution for academic reasons must accompany their application with a statement from the dean or other appropriate official of their previous institution setting forth the reasons for dismissal or probationary status with recommendation for continued study. All applicants will be considered on their own merits.

By Examination

Credit is granted for successful completion of appropriate examinations in the College Level Examination Program (CLEP). Credit may be disallowed for work previously completed because of the remoteness of the time of study; however, these applicants may take CLEP Examinations where appropriate. Credit is also granted for non-collegiate experience in both the Liberal Arts and Law Enforcement Programs. See pages 87 and 109.

In all cases students admitted by transfer or advanced standing credit from any other institution must meet the requirements for matriculated status as set forth under the regulations applicable to regular students.

Residence Requirement

Every candidate for the baccalaureate or associate degree must fulfill the residence requirement. The residence requirement is defined as the satisfactory completion in University College immediately preceding graduation of 46 consecutive quarter hours of work in course, with the further provision that at least 12 of the 46 quarter hours must be in the candidate's major field. All programs to meet the residency requirement must have the approval of the Dean. Students whose attendance in degree programs is interrupted for a period of one year or more will be reinstated into the program in effect at the time of their re-entry into University College.

In the case of students who for causes beyond their control move outside of the reasonable commuting area of the College, and who have

completed 134 or more quarter hours of credit, the Committee on Education will entertain a petition to allow them the privilege of completing their degree requirements at some other approved college. Under no circumstances will a degree be awarded to any student who has completed less than 46 quarter hours of credit in courses in University College.

Quality Requirement for Graduation

A cumulative quality point average of 2.00 (an average grade of C) is required for graduation. Advanced standing credits are not averaged in the cumulative score.

Graduation with Honor

Candidates who have achieved distinctly superior attainment in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. To be considered for graduation with honor, a student must have completed a minimum of 72 quarter hours of work at University College. Courses credited by advanced standing will be eliminated in determining honor graduates.

Attendance at Commencement

Attendance at commencement for all University College degree candidates is optional. Degree candidates will be polled by the commencement committee in this regard during the Spring Quarter.

Quality Points

The requirement for graduation from University College is 174 quarter hours for a bachelor's degree and 96 quarter hours for an associate's degree, with attainment of a quality point average of 2.00. Although the credits allowed for acceptable work completed elsewhere by transfer students count toward fulfillment of quantitative graduation requirements, neither the credits nor the grades earned in such courses is included in quality point computations for graduation.

The method of figuring quality points is as follows: Each quarter hour credit of A grade is multiplied by 4, B grade by 3, C grade by 2, D grade by 1, and F grade by 0. The total number of quality points, divided by the total number of quarter hour credits completed, shall be the quality point average.

Students receiving an F grade in a required course must repeat the course in its entirety including term work, examinations, and attendance.

Quality Point Averages

The Registrar's Office will not be able to recalculate or confirm the calculations of quality point averages for individual students. Each student's record will be brought up to date before his graduation. In the meantime, borderline cases will be checked by the Director of Admissions of University College.

Dean's List

All matriculated students who have taken a minimum of 18 quarter hours in three consecutive quarters (Fall, Winter, Spring) of an academic year and have completed all their courses with an average of 3.0 or better shall be placed on the Dean's List. Each student shall receive a letter of commendation from the Dean of University College.

Pass-Fail Courses

Any student who is not on academic probation and who has completed 40 Q.H. of academic work may register for one pass/fail course and, thereafter, for one course on a pass/fail basis for each 10 Q.H. of successfully completed work. Written permission of the appropriate academic dean must be obtained for each pass/fail course. At no time may a student register for more than one pass/fail course per quarter.

Such courses will be restricted to free electives outside the major field of specialization, so that no part of the specifically prescribed curricula will be affected.

The grades recorded on the basis of the pass/fail system of grading will not figure in the computation of the QPA.

Satisfactory completion of the work in all courses taken on the pass/fail system of grading will be designated on the transcript by the letter "S." Unsatisfactory work will be designated on the transcript by the letter "U." Any unsatisfactory grade must be handled according to the existing policy of the University, but must never be cleared through the election of the same course on the basis of the pass/fail system of grading.

An incomplete in a course taken on a pass/fail basis will be designated by the letter "X" on the transcript and must be treated according to the normal procedure for incomplete grades.

The following REGISTRATION PROCEDURES shall prevail:

Students wishing to use the pass/fail system of grading for a course must meet all prerequisites for such course and should signify their desire to apply for a specific course on the basis of this system of registration.

The student's decision to take a course on a pass/fail basis must be made prior to the second meeting of the course and no changes will be permitted thereafter.

Class Changes

University College reserves the right to cancel, split, or combine classes when necessary.

Registration

Before attending classes, students must report to the registration area to register. All students must complete their registration properly before attending class. Attendance at class, even with the instructor's permission, does *not* constitute registration.

No academic credit will be recorded for students not properly registered.

In order to insure academic success, students are strongly advised to adhere to course prerequisites.

Class Attendance and Preparation

Students are expected to attend all exercises in the subjects they are studying unless excused in advance.

Absence from regularly scheduled exercises in any subject will seriously affect the standing of the student. Consecutive absences may cause the removal of the subject or subjects from the student's schedule.

Two hours of preparation are normally required for each hour spent in the classroom.

Withdrawal Policy

A student may be withdrawn from a course in several ways:

VOLUNTARY WITHDRAWAL—The student completes a drop course form in the Registrar's Office or notifies the Registrar in writing of his intention to withdraw from the course.

INITIAL ABSENCE WITHDRAWAL—If a student is absent without permission from the first three meetings of a course, he will be withdrawn by the Registrar.

END OF COURSE WITHDRAWAL—If, by the ninth or tenth week of the quarter, the Registrar, after examining the attendance book, has every reason to believe the student has dropped from the course, he will officially withdraw the student and so note in the attendance book.

Change of Address

Change of address and/or name should be reported immediately to the Registrar's Office.

Absence Because of Illness

All students who are absent from school because of extended illness, and do not wish to be withdrawn, should inform the Registrar's Office by letter.

Examinations

Term tests are scheduled in each quarter at the option of the instructor and are regarded as part of the term's course work. A final examination will be held at the end of each quarter in each course unless an announcement to the contrary is made.

Homework Assignments

Students are responsible for obtaining their homework assignments by contacting their instructor or another student in their class. Homework assignments are not available in the University College Office.

Missed Final Examinations

A student does not automatically have the right to make up a missed final examination. Students must petition for this privilege and must pay a fee of $5.00 for each special examination when filing for the special make-up exam. All students who wish to clear an I (incomplete) grade must pay the fee and file the proper petition in the Registrar's Office, 120-HA, or in each off-campus administrative office. Petitions for missed finals must be filed in accordance with the schedule listed below:

final examination missed during:	**file petition no later than:**	**make-up final exam during week of:**
Fall Quarter 1975	January 16, 1976	February 9, 1976
Winter Quarter 1976	April 16, 1976	May 10, 1976
Spring Quarter 1976	July 9, 1976	August 9, 1976
Summer Quarter 1976	October 8, 1976	November 1, 1976

Students will be notified by mail when and where to take the missed final examination. All examinations will be administered on the Boston Campus.

Students who do not take make-up final examinations as scheduled (see below for I grade explanation) and clear an incomplete through the instructor, will be billed the $5.00 make-up exam fee by the Bursar before the I grade is changed.

Grading System

The following system of grading is used. The numerical equivalent for each grade is in parentheses.

A (4.0) — Outstanding
B (3.0) — Good
C (2.0) — Satisfactory
D (1.0) — Poor
F (0.0) — Failure
I (—) — Incomplete
L — Audit (No Credit)-UC and LC only
S — Satisfactory (Pass-Fail Grade)
U — Unsatisfactory (Pass-Fail Grade)
X — Incomplete (Pass-Fail Grade)
* — Grade not received

A general average of D is unacceptable and will not allow a student to continue in University College or to receive a degree from Northeastern University. The F grade is a definite failure and requires repetition of course in its entirety. The I grade is given only when the student fails to take the final examination.

The I Grade

The I grade may be given only when the student fails to take the final examination.

An instructor may decide that a student has done so poorly in the course that even a perfect grade in a make-up final could not raise the grade from F, in which case F is the proper grade, irrespective of the missed final.

If the student fails to complete some other major portion of the course work (examination, quizzes, major paper, etc.) a letter grade (A, B, C, D, F) should be assigned. This grade can be changed, upon petition, when the deficiency which led to the assigned letter grade is made up to the satisfaction of and in the manner prescribed by the instructor.

All deficiencies must be made up in the prescribed manner no later than the quarter following the recording of the grade.

*Grade Reports

An official grade report will be mailed approximately three weeks after the quarter is completed to each registered student. Grades will not be given over the telephone or at the Registrar's Office.

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*A supplementary grade report will be issued when the missing grade is received. Please do not call the Registrar's Office for it. University regulations prohibit issuing grades by telephone.
S, U, X, I and L grades are not included in the Quality Point Average. S grades are included in "Earned Hours" toward the degree. Cumulative totals do not appear on reports for non-matriculated students.

Auditing Policy

Students are permitted to audit courses upon filing the usual registration forms and paying the regular tuition fees. There is no reduction in fees for auditing. An auditor may participate in class discussion, complete papers and projects and take tests and examinations for informal evaluation, if desired. However, regardless of the amount or quality of work completed, **no academic credit will be granted at any time for courses audited.**

Audit Procedure

The student's decision to take a course on an audit basis must be communicated in writing to the Registrar prior to the fourth class meeting of the course. No exception to this procedure can be approved without authorization by the Academic Standing Committee of the College.

Calculation of Quality Point Average

1. When the student has more than one grade in the same course, the most recent grade will be used in the calculation of the quality point average.
2. A grade of I will not be considered in the calculation of quality point average.
3. Although advanced standing credits (ASC) allowed for acceptable work completed at other institutions by transfer students count toward completion of the quantitative credit requirements, neither the credits nor the grades earned in such courses is included in quality point average computations.

For example, a student who has registered for seven courses, cleared a failure in one of them, and received advanced standing credit (ASC) in another, may calculate his quality point average as follows:

Grade Achieved	Numerical Equivalent	Credit Hours		Quality Points
A	4.0	× 4	=	16.0
B	3.0	× 4	=	12.0
C	2.0	× 3	=	6.0
D	1.0	× 3	=	3.0
F	0.0	× 2	=	0.0
F B	3.0	× 2	=	6.0
I	—	× —	=	—
ASC	—	× —	=	—
		Totals 18		43.0

$$\text{Quality Point Average} = \frac{\text{Total Quality Points (43.0)}}{\text{Total Credit Hours (18)}} = 2.389$$

Academic Probation

Students whose scholarship in any given period is unsatisfactory may be dropped from the College or may be placed on probation.

Disciplinary Action

The Committee on Regulations and Discipline has the authority to dismiss from the College or place on probation at any time or to strike from the list of candidates for the degree, any student deemed unworthy because of conduct or character.

Maximum Course Load

New students may elect up to five (5) subjects per quarter without special permission.

Former students, who are not on the Dean's List, may also elect up to five (5) subjects per quarter without special permission. Program Directors may allow six (6) subjects if the student has a 2.50 Q.P.A. or better.

Dean's List students may elect any number of subjects per quarter not to exceed sixteen (16) quarter hours without special permission.

Not all the courses listed in this bulletin will be offered. A final list of those classes to be offered will be contained in the University College Schedule of Courses which gives the hours, days and location of classes. This schedule is issued prior to the Fall, Winter, Spring, and Summer Quarters.

Changes in Requirements

The continuing development of University College forces frequent revision of curricula. In every new bulletin some improvements are indicated. When no hardship is imposed on the student because of changes, and when the facilities of the school permit, the student is expected to meet the requirements of the latest bulletin. If the student finds it impossible to meet these requirements, the bulletin for the year in which he entered becomes the binding one.

tuition and fees

Tuition and fees are refundable only as stated under "Refund of Tuition." Checks and drafts for all charges are to be drawn to the order of Northeastern University.

Initial Registration Fee

A ten dollar ($10.00) registration fee, required of all new students is due and payable upon registration. This fee is nonrefundable.

Tuition

Tuition for all credit courses is $35.00 per quarter hour of credit. Charges for registration and tuition for special courses are at the rate specified for each course. Students are permitted to audit courses, however, there is no reduction in fees for auditing.

Non-credit courses are charged at quarter hour rates comparable to those of credit courses meeting on an equivalent contact hour schedule.

Students are not permitted to attend class sessions or take any examination or test until they have paid their tuition fees or have made satisfactory arrangements for payment.

Students will not be advanced in class standing, or permitted to re-enroll in the University, nor will degrees be conferred until all financial obligations to the University have been met.

No certificate of honorable dismissal will be issued to any student who has not fully met his financial obligations to the University.

Tuition Budget Payment Plans

Occasionally situations develop—usually beyond the control of the student—which make it difficult to meet the payments in the manner outlined above. Under such circumstances the student is advised to discuss his problem personally at the Bursar's Office, where one of the budget plans or a deferred payment agreement may be worked out. Such arrangements should be made before the end of the first week of the quarter or within one week of the date of registration if

the student enters late. A charge of $2.00 will be made. Failure to take immediate action will result in a late payment fee of $10.00.

Tuition Underwritten by Employers

An increasing number of companies are underwriting part or all of the cost of tuition of students in their employ. In cases where payment is to be made directly by the employer to the University, the student should furnish to the Bursar's Office a purchase order covering his registration or a statement from an officer of his company certifying that the company is underwriting the tuition.

Veterans' Benefits

Any veteran covered by Public Law 89-358 should report to Room 251 Richards Hall to fill out the proper enrollment forms.

Late Payment Fee

Bills for tuition and fees are payable on or before Saturday of the week of issuance. A late payment fee of $10.00 is charged to all students failing to comply unless special payment arrangements are approved by the Bursar's Office.

Refund of Tuition

The general policy in all schools and colleges of the University with respect to refunds of tuition to students is as follows:

The University provides all instruction on an academic quarter basis for which students pay at the beginning of each quarter. Tuition refunds will be granted through the first four weeks of a quarter only when specific conditions are met. Questions regarding refunds should be discussed with the Bursar.

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal application when filed with the Registrar in Room 120 Hayden Hall. Non-attendance does not constitute official withdrawal.

Refunds will be granted in accordance with the following schedule:

official withdrawal filed within:	percentage of tuition
1st week of quarter	100%
2nd week of quarter	75%
3rd week of quarter	50%
4th week of quarter	25%

Courses in Other Departments of the University

University College students assigned to courses in other departments of the University are charged the tuition rates and other fees effective in the departments in which they are enrolled.

Student Center Fee

All students in University College on the Huntington Avenue Campus are charged $.75 each quarter for the services available in the Student Center.

Laboratory Fee

All students enrolled in biology or health professions courses which include laboratory, must purchase from the Bursar's Office a Laboratory Fee and Deposit Card for $15.00 ($5.00 for extra cards). For chemistry, the cards cost $20.00 per quarter with the possibility of a $5.00 refund at the end of the quarter, depending upon breakage. The fee for arts and crafts courses is $5.00. Upon completion of the course or withdrawal during the quarter, the student must check his status with the laboratory attendant. The Bursar's Office will then refund any unused balance shown on the Laboratory Fee and Deposit Card.

Graduation Fee

The University graduation fee, charged to those who are candidates for the baccalaureate or associate degree, is $25.00 payable on or before May 1 of the year in which the student expects to graduate.

Missed Final Examination Fee

Students absent from the regularly scheduled final examination at the end of a course may petition for a "Missed Final Examination." The fee for each examination requested by the student is $5.00. The fee must be paid when the petition is filed in the University Registrar's Office.

Transcripts

Students may request transcripts of their grades at the Registrar's Office. There is a charge of $1.00 per copy, payable in advance.

financial aid and scholarships

General information pertaining to financial aid opportunities and specific scholarship applications for part-time students are available in the University College Admissions Office, Room 102 Churchill Hall.

The following scholarships and awards are available to students enrolled in University College.

Professor Joseph A. Mullen Scholarships

The Massachusetts Chapter of the American Society of Training and Development has established a fund to provide annual scholarship awards to deserving part-time students upon the recommendation of the Dean of University College.

Martin Luther King Jr. Scholarships

Established in 1969 in memory of the late Rev. Martin Luther King Jr. Awards are made as openings occur, to adults from minority groups who would otherwise be unable to continue their education. Stipends will cover tuition expenses not to exceed six quarter hours in any academic quarter (excluding Summer Quarter).

Kappa Tau Phi Scholarships

The Kappa Tau Phi Sorority Scholarship Fund annually makes available scholarship awards. They are granted to women students in the liberal arts, business, and engineering programs, respectively, who rank highest at the end of the upper-middle year. In the event the student is eligible for an award of greater monetary value, the award will be made to the next highest-ranking woman student. To be eligible for this scholarship, the student must be enrolled in a program of at least two evenings per week and must be a candidate for the bachelor's degree. In determining the recipient, grades of all courses completed in prior years shall be considered.

Harry Olins Scholarship

The Harry Olins Scholarship Fund was established as an expression of firm belief in University College students and "what they stand for."

The fund, presented by Mrs. Harry Olins in recognition of her husband's long service on the faculty, makes available an annual tuition award to two students who in terms of scholastic achievement, character, and personal need best typify the spirit of Northeastern University.

To be eligible for this award, the student must be a degree candidate and carry a full academic load during the school year.

Northeastern University Alumni Club of Lowell Scholarships

The Northeastern University Alumni Club of Lowell awards scholarships annually to evening students in University College from the Greater Lowell area who demonstrate high scholastic ability and are in need of financial assistance. Students interested should obtain an application in the University College office, 102 Churchill Hall. Upon filing an application and submitting a resume, the student will be required to complete an interview with the Scholarship Committee of the Alumni Club of Lowell.

Pilot Freight Carriers Scholarships

Pilot Freight Carriers, Winston-Salem, North Carolina, awards $500 annually to advanced transportation students who have achieved high academic standing and who have paid their tuition expenses without prior aid. The award may be shared by more than one student. Qualified candidates should apply during the Spring Quarter, in University College, 102 Churchill Hall. The final determination is made by the Dean of University College.

H. Patricia Taylor Scholarship Fund

The H. Patricia Taylor Scholarship Fund was established in 1974 by H. Patricia Taylor, a graduate of University College, and her husband, Harry C. Taylor, a graduate of the School of Business. The Scholarship expresses their appreciation for financial assistance made available to Mrs. Taylor while obtaining her degree, and is an attempt to provide similar funds to assist others in realizing their potential through higher education. The income from the Scholarship Fund will be awarded annually to a student enrolled in University College or Lincoln College who demonstrates financial need and academic stability and who meets certain other conditions of eligibility.

University College Faculty Club Memorial Scholarship Awards

The Faculty Club of University College, Northeastern University, offers two awards annually, primarily for excellence in studies, to Bachelor degree candidates in University College who have carried, and are currently carrying, a minimum of 24 quarter hours annually. Applica-

tions, available during the Winter Quarter, must be returned before the Spring Quarter.

These awards shall be known as University College Faculty Club Memorial Scholarship Awards in commemoration of the Club's deceased members.

U.S. Navy Field Training Supervisors Association Memorial Scholarship

A scholarship fund has been established by the generosity of the United States Navy Field Training Supervisors Association, in commemoration of the Association's deceased members. The Scholarship is awarded annually to a deserving student, selected by the Committee on Scholarships, who is a Management major, working toward a Bachelor of Science degree in the evening program of University College.

Sigma Epsilon Rho Honor Society Scholarship Award

The Sigma Epsilon Rho Honor Society Scholarship Award, established in 1974 by the membership of the Society, is awarded annually to an undergraduate student of University and/or Lincoln College at Northeastern University. Eligible students must have a cumulative Quality Point Average of 3.0 or better after completing 80 percent or more of their required studies.

Traffic Club of New England Scholarship

The Traffic Club of New England provides 12 basic and four advanced scholarships annually for persons employed in transportation and industry traffic departments. The scholarships are divided equally between industry and carrier applicants, and each award is applicable toward tuition, books, and incidental expenses involved in Transportation Management courses. The purpose of the plan is to afford a limited number of young men an opportunity to expand and improve their education by systematized study in courses in the field of transportation and traffic management. The scholarships are administered cooperatively with the Scholarship Committee of the Traffic Club of New England. Applications may be secured from and filed with the Secretary, The Traffic Club of New England, 294 Washington Street, Boston, Massachusetts 02108.

Community Sources

Students and their families are urged to explore community, industrial, and foundation sources for collegiate financial aid. Parental employers or the appropriate union organization may be a source. In addition, local, civic, political, religious, or educational leaders are often aware

of aid sources in immediate community. Some typical sources may include: P.T.A., Kiwanis, Lions, Elks, Knights of Columbus, Masons, Sons of Italy, Rotary, State Rehabilitation, American Legion, etc.

University Grants

Each year Northeastern University grants a substantial number of full and partial tuition grants to students who have demonstrated both above-average scholastic achievement and financial need. All applications for aid are automatically considered for all grants administered by the University. It is not necessary for an applicant to specify the grant in which he is interested.

National Direct Student Loan

This program is available to students who are carrying at least one-half the normal academic workload, are accepted as degree candidates, and who show evidence of financial need.

Students may borrow as much as $1500 each academic year, up to the maximum of $7500 for their undergraduate education, or a total of $10,000 through the completion of graduate studies. Repayment and interest on these loans do not begin until nine months after the student ceases to carry at least a half-time academic load at an institution of higher education. The repayment of principal may be extended over a ten-year period with the interest at the rate of 3% per annum. Repayment may be deferred up to a total of three years while a borrower is serving as a Peace Corps or VISTA volunteer.

Borrowers who elect to teach the disadvantaged or handicapped may qualify for cancellation of their entire obligation at the rate of 15% per year of teaching service. A borrower serving as a full-time member of the Armed Services of the United States is entitled to cancel 12½% per annum of the principal outstanding on any loans, for each year of such service, up to a maximum cancellation of 50%.

Guaranteed Student Loan Program

Under this program, students who are matriculated degree candidates, enrolled for at least one-half the normal academic work load, may borrow from a participating bank or other financial institution. Terms and conditions vary from state to state, but a student generally may borrow up to $2,000 a year (the law allows a maximum of $2,500 per year) depending on financial need. The Federal Government pays the interest while the student is in school if the student is eligible for interest subsidy.

Applications for the loan itself are available from local banks or the Education Office of your state government. Additional information and

necessary application forms for Massachusetts residents are available from the Financial Aid Office.

Veterans' Benefits

Any veteran covered by the Veterans Readjustment Act of 1966, Public Law 89-358, should report to Room 251 Richards Hall to fill out the proper enrollment forms. These forms will be made available during registration periods for all students in the Law Enforcement Programs at special off-campus locations.

Students needing additional information as to eligibility, allowances, or other details are urged to contact their local office of the Veterans Administration as early as possible.

Law Enforcement Assistance Administration

The Law Enforcement Assistance Administration, U.S. Department of Justice, has set up an Office of Academic Assistance under authority of the Omnibus Crime Control and Safe Streets Act of 1968, Public Law 90-351. Through the University, loans up to $2200 per year for tuition and grants up to $250 per academic quarter for tuition and fees are available to law enforcement personnel in undergraduate or graduate programs leading to degrees or certificates in areas directly related to law enforcement.

The loans, limited to full-time students in or preparing for law enforcement or corrections careers, are cancelled at the rate of 25 percent for each year the recipient subsequently serves in law enforcement at federal, state, or local level.

The grants are available to full-time or part-time students employed in a publicly-funded law enforcement agency, and involve a signed agreement to remain in the service of a law enforcement agency employing such applicant for two years following completion of the course for which aid was given.

Applications for loans or grants should be obtained from the Office of Financial Aid, Room 252 Richards Hall.

Please note that aid granted from programs sponsored by the Federal Government is dependent upon the amount of funds allocated to Northeastern.

The University does not award financial assistance in any form to non-citizens of the United States.

student activities

Student activities for part-time students are planned, organized, and operated by the student body with the assistance of the Director of University-Lincoln College Student Activities. The programs are designed to keep pace with the changing needs of adult students and to provide maximum opportunity for student participation. All part-time students in University College and Lincoln College are welcome to participate.

The program is flexible in nature and pioneering in spirit to meet the needs of adult students. The Office of University-Lincoln College Student Activities is particularly interested in developing new clubs which will benefit students professionally and educationally. If students wish to start clubs related to their professions, this office will help them plan and organize clubs on the local and national level. The program is dedicated to assisting the adult student in the development of his fullest potential. The University-Lincoln College Student Activities Office is located in 102 Churchill Hall.

Purpose

The purposes of part-time student activities are:

To provide opportunities for the development and pursuit of cultural interests and professional objectives.

To encourage the development of leadership activities and skills.

To enable the student to identify more closely with the University.

To include the family, as an important and vital motivating force, in the part-time student's educational career.

Sigma Epsilon Rho Honor Society

Sigma Epsilon Rho is the honor society of University College. Its purposes are:

To promote acquaintance and good fellowship among those students who have attained highest scholastic standing in the College.

To stimulate the student body to higher scholastic accomplishment

through the bearing, influence, and work of these selected men and women.

To develop methods of mutual improvement and advancement among members.

To support high moral, professional, and scholastic ideals.

Only honor graduates or seniors with honor standing at the end of the junior year are eligible for admission to the society. Admission is by invitation after nomination by the society.

An outstanding book is awarded each year by Sigma Epsilon Rho Society to the highest-ranking student at the conclusion of the junior year. Students will receive the award only in the event that they enroll for the subsequent year.

Northeastern Flying Huskies

The Flying Huskies was organized by the students of the aviation technology program in the Spring of 1969. The main objective of the organization is to promote safety and precision in aviation. During the past several years the "Huskies" have been involved with intercollegiate competition and have been invited to the national championships for four consecutive years. Thanks to the support of many interested parties and a fine membership, the "Huskies" are becoming well-known in the collegiate flying circle. Although membership is restricted to those enrolled in the aviation technology program, the club hopes to promote comradeship among all pilots.

Lambda Alpha Epsilon

Lambda Alpha Epsilon is a national law enforcement fraternity founded in 1957. The Northeastern Chapter Kappa Phi Beta is open to part-time and day students enrolled in Law Enforcement and Security Programs, and also to professional men in the fields of law enforcement and security. The fraternity is dedicated to the furtherance of professional standards in law enforcement.

Evening Student Council

The Evening Student Council was formed to provide a representative body to promote the welfare of the student body in non-academic areas and to foster extracurricular activities which will enrich University life. It affords participants opportunities to meet and develop close personal relationships with fellow students and the administrative staff.

The Evening Student Council provides students with opportunities to develop leadership skills and gives them a chance to discuss matters of professional interest with experts in their chosen field.

The Council is made up of interested students in University and Lincoln College, representatives of part-time interest groups, and those specially certified by the Council because of their demonstrated interest in the overall adult programs of the University.

The E.S.C., a member of the United States Association of Evening Students, meets evenings on a monthly basis in the Student Center. Students are welcome to visit, observe, and express opinions concerning part-time student life. Free refreshments are served at all meetings.

Use of Gymnasium Facilities

Specific schedules for use of the pool, weight training room, indoor athletic field and track, handball courts, gymnasium, and wrestling room are set up each quarter for use by all part-time students. In order to become eligible, students must obtain a temporary Gymnasium Pass each time they wish to use the Cabot Gymnasium Complex. Passes are available in the Cabot Complex, Monday through Friday from 4:30 p.m. to 9:00 p.m. and on Saturday and Sunday from 1:00 p.m. to 4:00 p.m. All students requesting a pass must present their Student Identification Card prior to receiving a pass. Passes are issued on a first-come, first-served basis. Students using the Cabot Gymnasium Complex are required to abide by all the Rules of the Gym and may be asked to complete a Medical Release form.

Evening Ski Club

The Evening Ski Club was established as a special interest club by students in University and Lincoln College to give skiers an opportunity to meet other skiers for the purpose of promoting the sport and its related activities. Events sponsored by the Evening Ski Club include wine and cheese parties held locally and in the various ski areas of Maine, New Hampshire, and Vermont. A summer clambake is also arranged on a local beach, usually in July or August. Meetings are held from October through April on a bi-weekly basis on the main campus. Students interested should contact the Evening Student Activities Office in 102 Churchill Hall.

Alumni Association

More than 52,000 alumni are members of the all-University Alumni Association which has as its prime purposes the promotion of the welfare of Northeastern University, the establishment of a mutually beneficial relationship between the University and its alumni, and the perpetuation of fellowship among members of the Association.

The Alumni Relations office is located in Room 101, Ell Student Center. The official records and addresses of alumni are maintained in Room 260, United Realty Building.

Activities of the Association, including the Homecoming Day celebration and the annual presentation of Professional Promise Awards to outstanding seniors in Lincoln and University Colleges, are directed by the Vice President for Alumni Affairs. Alumni officers also attend meetings of the undergraduate classes to form a closer relationship between the Association and its future members.

The Alumni Relations Office assists the various class officers in planning class reunions. Each class normally holds a reunion every five years during the month of June. The Vice President for the Alumni Class Council is responsible for coordinating class activities and organizing class functions.

The Vice President for Alumni Clubs works in close association with officers of the more than 50 Regional Alumni Clubs which have been established from coast to coast. All alumni are eligible to become members of these organizations. The alumni clubs meet periodically, often in conjunction with visits from members of the faculty or with athletic events.

For Boston area alumni, monthly luncheon meetings are held in both the downtown and uptown sections of the city.

The Association also sponsors and assists the Alumnae Organization and the Varsity Club, both of which have their own officers and conduct various programs throughout the year. Through the Varsity Club, the Association presents trophies to the outstanding athlete of the year in each of the five major sports.

One of the most recent developments in alumni activities is the organization of seminars which are conducted by the Association in cooperation with the University's Center for Continuing Education. The seminars are designed particularly for alumni who have a special interest in current events and the field of adult education.

The Northeastern University Alumni Association is a member of the American Alumni Council, a professional organization composed of representatives of all major colleges and universities in the United States and Canada.

Alumni Relations

The Alumni Association is providing a uniquely valuable service to both the University and the community by sponsoring admissions conferences for parents of high school students who are interested in attending college. These meetings, held in cooperation with the Northeastern Department of Admissions, have been extremely well attended. Local residents as well as Alumni of the University have been invited to these conferences which help to clarify many of the questions today's parents and young people have concerning application procedures of colleges and universities.

programs of study

University College conducts part-time educational programs at the undergraduate level during day and evening hours. The programs are designed to meet the varying needs and interests of adult students who may enroll as (1) *Regular* students following degree programs or as (2) *Special* students taking single courses or special programs.

University College programs leading to the Bachelor of Science and Bachelor of Arts degrees provide opportunities for cultural and professional development equivalent in quality and scope to those offered in the conventional four-year college enrolling full-time students. The bachelor's degree requires 174 quarter hours of credit.

Programs leading to the Associate in Science degree provide students a background in fundamental areas in business administration, liberal arts, law enforcement, health professions, and therapeutic recreation services. The Associate degree requires 96 quarter hours of credit and is equivalent to the conventional two-year or junior college in scope and quality.

Degree curricula are offered in the following areas:

BUSINESS ADMINISTRATION

Major	Degree	Page
Business Administration	Associate in Science	60
Electronic Data Processing	Associate in Science	62
Purchasing	Associate in Science	64
Real Estate	Associate in Science	66
Accounting	Bachelor of Science	68
Finance	Bachelor of Science	69
Industrial Management	Bachelor of Science	71
Industrial Technology	Bachelor of Science	72
Insurance	Bachelor of Science	73
Management	Bachelor of Science	74
Management Information Systems	Bachelor of Science	76
Marketing	Bachelor of Science	78
Personnel and Industrial Relations	Bachelor of Science	79
Transportation and Physical Distribution Management	Bachelor of Science	80
Combined Program in Liberal Arts and Management	Bachelor of Science	82

LIBERAL ARTS

Major	Degree	Page
Economics	Bachelor of Arts	89
English	Bachelor of Arts, Bachelor of Science	90
Fine Arts	Bachelor of Arts, Bachelor of Science	91
History	Bachelor of Arts, Bachelor of Science	93
Liberal Arts	Associate in Science	94
Music	Bachelor of Arts, Bachelor of Science	103
Political Science	Bachelor of Arts, Bachelor of Science	95
Psychology	Bachelor of Arts	98
Sociology-Anthropology	Bachelor of Arts, Bachelor of Science	100
Chemical-Biological Technology	Associate in Science	105
Chemical-Biological Technology	Bachelor of Science	106

LAW ENFORCEMENT

Major	Degree	Page
Correctional Practices	Bachelor of Science	110
	Associate in Science	114
Law Enforcement	Bachelor of Science	116
	Associate in Science	120
Security	Bachelor of Science	122
	Associate in Science	126

HEALTH PROFESSION PROGRAMS

Major	Degree	Page
Health Science	Bachelor of Science	130
Management in Health Agencies and Institutions	Bachelor of Science	132
Medical Laboratory Science		
Cytotechnology	Bachelor of Science	143
	Associate in Science	143
Medical Technology	Bachelor of Science	146
	Associate in Science	146
Medical Record Administration	Bachelor of Science	136
	Certificate	138
Nursing Home Administration	Certificate	134
Radiologic Technology	Associate in Science	152
Respiratory Therapy	Associate in Science	140
Medical Laboratory Science		
Hematology	Bachelor of Science	149

EDUCATION

Major	Degree	Page
Teaching of English (in grades 7–12)	Bachelor of Science	157

Course descriptions are listed in numerical order by department beginning on page 162.

THERAPEUTIC RECREATION SERVICES

Major	Degree	Page
Therapeutic Recreation Services	Certificate	161
	Associate in Science	161

business administration

Paul D. Maxwell, Assistant Dean
Director, Business Administration Programs
Telephone 437-2418

Aims

Business Administration programs of study are offered to meet the needs of adult men and women wishing to acquire a college education on a part-time basis. The opportunity to achieve professional competence in a chosen field, while developing potential for further managerial growth, is one of the program's principal objectives. Degree programs are designed to create both a breadth of perspective and a degree of specialization. Breadth of perspective will be obtained through exposure to a well-balanced sequence of liberal arts courses, which emphasize fundamental economic laws, and the social and cultural foundations of our changing American society. Specialized knowledge for future managerial growth will be acquired through the study of basic business courses, in addition to a self-determined study of a major business area.

Requirements

Associate in Science Degree

The Associate in Science degree is offered in the following fields of study: Business Administration, Electronic Data Processing, Purchasing, and Real Estate. To qualify for the associate degree 96 quarter hours must be successfully completed in one of the four associate programs. Detailed information on these programs together with a recommended sequence for completing them appears on the following pages.

New Students—Please Note:

In an effort to achieve a certain level of analytic and academic sophistication among students taking upper level business administration courses (designated by an asterisk wherever they appear in the catalog), University College instituted a new procedure in the Fall Quarter of 1969 whereby all new students are required to successfully com-

plete an appropriate associate degree program before they become eligible to take upper level business administration courses. Special students (students not pursuing a degree program) may take upper level courses if they can demonstrate to a program adviser (always present during registration) or to one of the deans in University College that they have an adequate background to cope with upper level course content. In determining whether a student has "an adequate background," the program advisers and the deans will evaluate, but not be limited to, such factors as work experience, former college work, independent study, etc.

The "appropriate" program for all Bachelor degree students, except the Management Information Systems (MIS) degree student, is the Associate degree program in Business Administration. The "appropriate" program for the MIS degree student is the Associate degree program in Electronic Data Processing (EDP). Students pursuing one of the other associate programs or students pursuing an "inappropriate" associate program (e.g., student following EDP associate program who wants to major in finance in his bachelor's program) may make special arrangements with the Dean of Administrations or the Director of Business Programs for a bachelor's program.

A student with a 2.0 average or better in an Associate degree program will be considered by University College as having "successfully completed" the program. It should be noted that students do not have to formally *receive* Associate degrees; successful completion of the Associate degree program (or demonstration of an "adequate background" in the case of special students) is all that is necessary for entry into upper level business administration courses.

The Bachelor of Science Degree

The Bachelor of Science degree in Business Administration is offered in the following fields of study: Accounting, Finance, Industrial Management, Industrial Technology, Insurance, Management, Management Information Systems, Marketing, Personnel and Industrial Relations, Transportation and Physical Distribution Management, and in the Combined Program in Liberal Arts and Management.

In general, the Bachelor of Science degree requires successful completion of the following areas of study:

Liberal Arts	**quarter hours**
Basic Courses and Electives	70
Business Administration	
Basic Courses	66
Major Field of Study	30
Electives (Business Administration or Liberal Arts)	8
Total	**174**

Detailed information on these programs appears on the following pages.

English Requirements

The English requirements shall be fulfilled by taking Composition and Rhetoric I, II, (30.601, 30.602), Introduction to Literary Forms I, II (30.604, 30.605), and four additional hours of literature. Please review the appropriate detailed program information. For new English requirements see explanation on page 220.

BUSINESS ADMINISTRATION — Associate in Science Degree

				quarter hours	
Basic Courses—Liberal Arts					
10.327,	10.328,	10.329	Mathematics I, II, III	6	
16.501,	16.502,	16.503	Earth Science I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
	30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles & Problems I, II, III	6	
39.511,	39.512,	39.513	Statistics I, II, III	6	44
Basic Courses—Business Administration					
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
43.501,	43.502,	43.503	Introduction to Marketing I, II, III	6	
44.501,	44.502,	44.503	Finance & Risk Management I, II, III	6	
45.501,	45.502,	45.503	Management & Organization I, II, III	6	
45.506,	45.507,	45.508	Production Management and Manufacturing Systems I, II, III	6	
	45.511,	45.512	Human Relations in Organizations I, II	4	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	
		45.599	Basic Computer Programming	2	
	45.610,	45.611	Labor Management Relations I, II	4	
		45.667	Project Planning and Control	2	48
Electives			Literature		4
			Total Credits		96

Students following a degree program should refer to suggested course sequence on the opposite page.

The following courses are frequently offered as single quarter intensives during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

19.508,	19.509	Fundamentals of Psychology I, II	8*
23.509,	23.510	Western Civilization A, B	6
	30.603	Composition and Rhetoric	4
	30.603	Composition and Rhetoric	4
	41.541	Accounting Principles	6
	43.504	Introduction to Marketing	6
	44.504	Finance & Risk Management	6
	45.641	Human Relations In Organization	4
	45.642	Production Management and Manufacturing Systems	6
	45.648	Electronic Data Processing	6
	45.652	Management and Organization	6
	45.690	Labor Management Relations	4

*Additional 2 quarter hours of credit may be applied to Liberal Arts Electives in B.S. degree programs.

BUSINESS ADMINISTRATION

Recommended Course Sequence for the 4-Year Program Leading to the Associate in Science Degree

	Quarter I	Quarter II	Quarter III
1st Year	Comp. & Rhet. I	Comp. & Rhet. II	Elective
	Accounting I	Accounting II	Accounting III
	Mgmt. & Org. I	Mgmt. & Org. II	Mgmt. & Org. III
	Earth Science I	Earth Science II	Earth Science III
2nd Year	Economics I	Economics II	Economics III
	Math. I	Math. II	Math. III
	Marketing I	Marketing II	Marketing III
	Fin. & Risk I	Fin. & Risk II	Fin. & Risk III
3rd Year	West. Civ. I	West. Civ. II	West. Civ. III
	Psych. I	Psych. II	Psych. III
	E.D.P. I	E.D.P. II	E.D.P. III
	Labor Mgmt. I	Labor Mgmt. II	Elective
4th Year	Intro. Lit. Forms I	Intro. Lit. Forms II	Project Planning
	Stat. I	Stat. II	Stat. III
	Prodn. Mgmt. I	Prodn. Mgmt. II	Prodn. Mgmt. III
	Basic Computer Programming	Hum. Rel. I	Hum. Rel. II

ELECTRONIC DATA PROCESSING — Associate in Science Degree

				quarter hours	
Basic Courses—Liberal Arts					
10.327,	10.328,	10.329	Mathematics I, II, III	6	
16.501,	16.502,	16.503	Earth Science I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
29.501,	29.502,	29.503	Effective Speaking I, II, III	6	
	30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles & Problems I, II, III	6	
39.511,	39.512,	39.513	Statistics I, II, III	6	44
Basic Courses—Business Administration					
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
44.501,	44.502,	44.503	Finance & Risk Management I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	24
Major Field of Study					
10.332,	10.333,	10.334	Mathematics for Business Management I, II, III	6	
45.573,	45.574,	45.575	Computer Programming for Business I, II, III	6	
		45.577	Data Systems Administration	2	
	45.578,	45.579	Business Data Processing Applications I, II	4	
		45.667	Project Planning and Control	2	
45.586,	45.587,	45.588	Systems Design and Techniques I, II, III	6	26
Electives			Liberal Arts		2
			Total Credits		96

Students following a degree program should refer to suggested course sequence on the opposite page.

The following courses are frequently offered as single quarter intensives during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

19.508,	19.509	Fundamentals of Psychology I, II	8*
	30.603	Composition and Rhetoric	4
	30.606	Introduction to Literary Forms	4
	41.541	Accounting Principles	6
	44.504	Finance and Risk Management	6
	45.644	Computer Programming for Business	6
	45.648	Electronic Data Processing	6
	45.652	Management and Organization	6
	45.689	Systems Design and Techniques	6

*Additional 2 quarter hours of credit may be applied to Liberal Arts electives.

ELECTRONIC DATA PROCESSING

Recommended Course Sequence for the 4-Year Program Leading to the Associate in Science Degree

	Quarter I	Quarter II	Quarter III
1st Year	Comp. & Rhet. I	Comp. & Rhet. II	Elective
	E.D.P. I	E.D.P. II	E.D.P. III
	Mgmt. & Org. I	Mgmt. & Org. II	Mgmt. & Org. III
	Math. I	Math. II	Math. III
2nd Year	Economics I	Economics II	Economics III
	Accounting I	Accounting II	Accounting III
	Math. for Bus. Mgmt. I	Math. for Bus. Mgmt. II	Math. for Bus. Mgmt. III
	Comp. Prog. Bus. I	Comp. Prog. Bus. II	Comp. Prog. Bus. III
3rd Year	Fin. & Risk I	Fin. & Risk II	Fin. & Risk III
	Psych. I	Psych. II	Psych. III
	Sys. Des. Tech. I	Sys. Des. Tech. II	Sys. Des. Tech. III
	Stat. I	Stat. II	Stat. III
4th Year	Intro. to Lit. Forms I	Intro. to Lit. Forms II	Project Planning
	Effective Spking. I	Effective Spking. II	Effective Spking. III
	Data Sys. Adm.	Bus. Data Proc. Appl. I	Bus. Data Proc. Appl. II
	Earth Science I	Earth Science II	Earth Science III

PURCHASING — Associate in Science Degree

Basic Courses—Liberal Arts				quarter hours	
10.327,	10.328,	10.329	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
	30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	
39.511,	39.512,	39.513	Statistics I, II, III	6	32
Basic Courses—Business Administration					
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
44.501,	44.502,	44.503	Finance and Risk Management I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	24
Major Field of Study					
		43.520	Industrial Marketing	2	
	45.511,	45.512	Human Relations in Organizations I, II	4	
		45.536	Principles of Material Inspection	2	
45.537,	45.538,	45.539	Purchasing I, II, III	6	
45.541,	45.542,	45.543	Law I, II, III*	6	
	45.610,	45.611	Labor Management Relations I, II	4	
45.623,	45.624,	45.625	Manufacturing Processes I, II, III	6	
	45.627,	45.628	Value Management I, II	4	
		45.626	Professional Purchasing Techniques*	2	36
Electives			Literature		4
			Total Credits		96

Students following a degree program should refer to suggested course sequence on the opposite page.

Additional Departmental Offerings

		45.666	Materials Acquisition Function	2

Please see page 256 for course descriptions.

The following courses are frequently offered as single quarter intensives during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

			quarter hours
19.508,	19.509	Fundamentals of Psych. I, II	8**
	30.603	Composition and Rhetoric	4
	30.606	Introduction to Literary Forms	4
	41.541	Accounting Principles	6
	44.504	Finance and Risk Management	6

*Upper level Business Administration course; may be taken in the Purchasing Associate Degree Program.

**Additional 2 quarter hours of credit may be applied to Liberal Arts electives in B.S. degree programs.

45.550	Purchasing	6
45.641	Human Relations In Organization	4
45.643	Law	6
45.648	Electronic Data Processing	6
45.652	Management and Organization	6
45.690	Labor Management Relations	4

PURCHASING

Recommended Course Sequence for the 4-Year Program Leading to the Associate in Science Degree

	Quarter I	Quarter II	Quarter III
1st Year	Comp. & Rhet. I	Comp. & Rhet. II	Elective
	Accounting I	Accounting II	Accounting III
	Mgmt. & Org. I	Mgmt. & Org. II	Mgmt. & Org. III
	Math. I	Math. II	Math. III
2nd Year	Economics I	Economics II	Economics III
	Psych. I	Psych. II	Psych. III
	Fin. & Risk I	Fin. & Risk II	Fin. & Risk III
	E.D.P. I	E.D.P. II	E.D.P. III
3rd Year	Intro. to Lit. Forms I	Intro. to Lit. Forms II	Elective
	Stat. I	Stat. II	Stat. III
	Purchasing I	Purchasing II	Purchasing III
	Manuf. Proc. I	Manuf. Proc. II	Manuf. Proc. III
4th Year	Law I	Law II	Law III
	Labor Mgmt. Rel. I	Labor Mgmt. Rel. II	Industrial Mktg.
	Hum. Rel. I	Hum. Rel. II	Prin. Mat. Inspec.
	Value Mgmt. I	Value Mgmt. II	Prof. Purchasing

REAL ESTATE — Associate in Science Degree

				quarter hours	
Basic Courses—Liberal Arts					
10.327,	10.328,	10.329	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
	30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	
39.511,	39.512,	39.513	Statistics I, II, III	6	**38**
Basic Courses—Business Administration					
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
44.501,	44.502,	44.503	Finance and Risk Management I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
45.541,	45.542,	45.543	Law I, II, III*	6	**24**
Major Field of Study					
47.501,	47.502,	47.503	Real Estate Fundamentals I, II, III	6	
	47.508,	47.509	Real Estate Financial Analysis I, II	4	
		47.511	Fundamental Real Estate Appraisal	2	
	47.512,	47.513	Advanced Real Estate Appraisal I, II	4	
		47.521	Real Estate Development	2	**18**
Electives			Literature	4	
			Liberal Arts	6	
			Business Administration	6	**16**
			Total Credits		**96**

Students following a degree program should refer to the suggested course sequence on the opposite page.

Additional Department Offerings

45.586,	45.587,	45.588	Systems Design and Techniques I, II, III	6
		47.524	Private Real Estate Law	2
	47.525,	47.526	Public Real Estate Law I, II	4
		47.527	Housing	2
47.528,	47.529,	47.530	Real Estate Management I, II, III	6

Please see page 270 for course descriptions.

The following courses are frequently offered as single quarter intensives during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

			quarter hours
19.508,	19.509	Fundamentals of Psychology I, II	8**
23.509,	23.510	Western Civilization A, B	6
	30.603	Composition and Rhetoric	4

*Upper level Business Administration course; may be taken in the Real Estate Associate Degree program.

**Additional 2 quarter hours of credit may be applied to Liberal Arts electives.

30.606	Introduction to Literary Forms	4
41.541	Accounting Principles	6
44.504	Finance and Risk Management	6
45.643	Law	6
45.652	Management and Organization	6

REAL ESTATE

Recommended Course Sequence for the 4-Year Program Leading to the Associate in Science Degree

	Quarter I	Quarter II	Quarter III
1st Year	Comp. & Rhet. I	Comp. & Rhet. II	Elective
	Accounting I	Accounting II	Accounting III
	Mgmt. & Org. I	Mgmt. & Org. II	Mgmt. & Org. III
	Math. I	Math. II	Math. III
2nd Year	Economics I	Economics II	Economics III
	Law I	Law II	Law III
	Fin. & Risk I	Fin. & Risk II	Fin. & Risk III
	R.E. Fund. I	R.E. Fund. II	R.E. Fund. III
3rd Year	Psych. I	Psych. II	Psych. III
	Stat. I	Stat. II	Stat. III
	R.E. Fin. Anal. I	R.E. Fin. Anal. II	R.E. Development
	Elective	Elective	Elective
4th Year	Intro. to Lit. Forms I	Intro. to Lit. Forms II	Elective
	Fund. R.E. App.	Adv. R.E. App. I	Adv. R.E. App. II
	Elective	Elective	Elective
	Elective	Elective	Elective

ACCOUNTING — Bachelor of Science Degree

				quarter hours	
Associate Degree Program					**96**
Core Courses—Liberal Arts					
21.501,	21.502,	21.503	Sociology I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	**12**
Core Courses—Business Administration					
41.504,	41.505,	41.506	Accounting—Intermediate I, II, III	6	
41.507,	41.508,	41.509	Accounting—Cost I, II, III	6	
44.507,	44.508,	44.509	Corporate Finance I, II, III	6	
45.541,	45.542,	45.543	Law I, II, III*	6	**24**
Major Concentration Courses					
41.510,	41.511,	41.512	Accounting—Advanced I, II, III*	6	
41.513,	41.514,	41.515	Accounting—Specialized Problems I, II, III*	6	
41.516,	41.517,	41.518	Auditing I, II, III*	6	
41.519,	41.520,	41.521	Federal Income Taxes I, II, III*	6	
41.522,	41.523,	41.524	Seminar in Contemporary Accounting Problems I, II, III*	6	**30**
Electives			Liberal Arts	10	
			Business Administration or Liberal Arts	2	**12**
			Total Credits		**174**

Additional Department Offerings

		41.525	Estate and Gift Taxes	2
	41.526,	41.527	Corporate and Stockholder Tax Problems I, II	4
		41.528	Tax Factors in Business Decisions	2
41.553,	41.554,	41.555	Internal Auditing I, II, II	6
45.586,	45.587,	45.588	Systems Design and Techniques I, II, III	6
	45.618,	45.619	Retail Data Processing Applications I, II	4
	45.655,	45.656	Auditing Data Processing Applications I, II	4
	45.661,	45.662	Banking Data Processing Applications I, II	4

Please see page 237 for course descriptions.

The following courses are frequently offered as single quarter intensives during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

			quarter hours
21.601,	21.602	Principles of Sociology I, II	8**

*Upper level Business Administration course—see page 57.
**Additional 2 quarter hours of credit may be applied to Liberal Arts electives.

		41.542	Intermediate Accounting	6	
		41.545	Auditing	6	
		44.505	Corporate Finance	6	
		45.643	Law	6	

FINANCE — Bachelor of Science Degree

				quarter hours	
Associate Degree Program					**96**
Core Courses—Liberal Arts					
21.501,	21.502,	21.503	Sociology I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
	39.517,	39.518	Money and Banking I, II	4	
		39.519	Public Finance	2	**18**
Core Courses—Business Administration					
41.504,	41.505,	41.506	Accounting—Intermediate I, II, III	6	
44.507,	44.508,	44.509	Corporate Finance I, II, III	6	
44.521,	44.522,	44.523	Credit Management I, II, III*	6	
45.541,	45.542,	45.543	Law I, II, III*	6	**24**
Major Concentration Courses—Students Specializing in Savings Banking and Real Estate:					
		39.561	Urban Economics	2	
		44.513	Estate Planning*	2	
44.517,	44.518,	44.519	Investments I, II, III*	6	
	44.554,	44.555	Savings Banks and Banking I, II	4	
47.501,	47.502,	47.503	Real Estate Fundamentals I, II, III	6	
		47.511	Real Estate Appraisal	2	**22**
Electives			Liberal Arts	4	
			Business Administration or Liberal Arts	10	**14**
			Total Credits		**174**
Major Concentration Courses—Students Specializing in Commercial Banking:					
		44.513	Estate Planning*	2	
44.517,	44.418,	44.519	Investments I, II, III*	6	
	44.531,	44.532	Seminar in Finance I, II*	4	
	44.533,	44.534	International Finance I, II*	4	
		44.553	New Venture Financing	2	
	44.556,	44.557	Commercial Banks and Banking I, II	4	**22**
Electives			Liberal Arts	4	
			Business Administration or Liberal Arts	10	**14**
			Total Credits		**174**

*Upper level Business Administration course—see page 57.

Major Concentration Courses—Students Specializing in Corporate Finance:

41.507,	41.508,	41.509	Cost Accounting I, II, III	6	
		41.528	Tax Factors in Decision Making	2	
44.517,	44.518,	44.519	Investments I, II, III*	6	
	44.531,	44.532	Seminar in Finance I, II*	4	
	44.533,	44.534	International Finance I, II*	4	
		44.553	New Venture Financing	2	**24**
Electives			Liberal Arts	4	
			Business Administration or Liberal Arts	8	**12**
			Total Credits		**174**

Major Concentration Courses—Students Specializing in International Finance:

39.523,	39.524,	39.525	Government and Business I, II, III	6	
	39.528,	39.529	International Economics I, II	4	
		39.571	European Economic History	2	
44.517,	44.518,	44.519	Investments I, II, III*	6	
	44.531,	44.532	Seminar in Finance I, II*	4	
	44.533,	44.534	International Finance I, II*	4	**26**
Electives			Liberal Arts	4	
			Business Administration or Liberal Arts	6	**10**
			Total Credits		**174**

The following courses are frequently offered as single quarter intensives during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

			quarter hours
21.601,	21.602	Principles of Sociology I, II	8**
	44.505	Corporate Finance	6
	44.535	Investments	6
	44.552	Personal Finance	4

Additional Department Offerings

44.545,	44.546	Profit Planning and Control I, II	4
	44.547	Advanced Financial Problems	2
	44.548	Capital Strategy	2
44.550,	44.551	Personal Finance I, II	4
45.586,	45.587,	45.588 Systems Design and Techniques I, II, III	6
45.616,	45.653	Government Data Processing Applications I, II	4
	45.643	Law	6
45.655,	45.656	Auditing Data Processing Applications I, II	4
45.661,	45.662	Banking Data Processing Applications I, II	4
45.664,	45.665	EDP in Property and Casualty I, II	4

Please see page 245 for course descriptions.

*Upper level Business Administration course—see page 57.
**Additional 2 quarter hours of credit may be applied to Liberal Arts electives.

INDUSTRIAL MANAGEMENT — Bachelor of Science Degree

				quarter hours	
Associate Degree Program					**96**
Core Courses—Liberal Arts					
10.332,	10.333,	10.334	Mathematics for Business Management I, II, III	6	
16.511,	16.512,	16.513	History of Science and Technology I, II, III	6	
19.532,	19.533,	19.534	Industrial Psychology I, II, III	6	
39.523,	39.524,	39.525	Government and Business I, II, III	6	**24**
Core Courses—Business Administration					
45.541,	45.542,	45.543	Law I, II, III*	6	
45.670,	45.671,	45.672	Management of Change I, II, III	6	**12**
Major Concentration Courses					
45.533,	45.534,	45.535	Management Decisions and Policies I, II, III	6	
	45.561,	45.562	Statistical Quality Control I, II	4	
		45.563	Management of Quality Control	2	
45.595,	45.596,	45.597	Manufacturing Seminar I, II, III*	6	
45.623,	46.624,	46.625	Manufacturing Processes I, II, III	6	
	45.636,	45.637	Production and Inventory Control I, II	4	
45.638,	45.639,	45.640	Industrial Decision Making I, II, III*	6	
		45.695	Materials Management	2	**36**
Electives			Liberal Arts or Business Administration		**6**
			Total Credits		**174**
Additional Department Offerings					
		45.519	Work Methods	2	
		45.528	Work Measurement	2	
		45.522	Job Evaluation	2	
	45.526,	45.531	Facilities Planning and Design I, II	4	
		45.530	Standard Data Development	2	
		45.577	Data Systems Administration	2	
45.586,	45.587,	45.588	Systems Design and Techniques I, II, III	6	
		45.620	Industrial Safety	2	
		45.626	Professional Purchasing Techniques	2	
	45.627,	45.628	Value Management I, II	4	
45.685,	45.686,	45.687	Computer Programming for Scientific Applications I, II, III	6	
		45.696	Principles and Practice of Management	2	

Please see page 252 for course descriptions.

The following courses are frequently offered as single quarter intensives during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details. (Continued on page 72)

*Upper level Business Administration course—see page 57.
**Additional 2 quarter hours of credit may be applied to Liberal Arts electives.

		quarter hours
45.608	Quality Control	4
45.643	Law	6
45.680	Production and Inventory Control	4
45.692	Quality Control	6

INDUSTRIAL TECHNOLOGY — Bachelor of Science Degree

				quarter hours	
Engineering or Science Technology Courses					**96**
Core Courses—Liberal Arts					
19.501,	19.502,	19.503	Psychology I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
	30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	**32**
Core Courses—Business Administration					
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
	43.514,	43.515	Marketing Fundamentals I, II**	4	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
45.541,	45.542,	45.543	Law I, II, III*	6	
	45.561,	45.562	Statistical Quality Control I, II	4	
		45.563	Management of Quality Control	2	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	
	45.610,	45.611	Labor-Management Relations I, II	4	
	45.673,	45.674	Industrial Processes I, II**	4	**42**
Electives			Literature		**4**
			Total Credits		**174**

The following courses are frequently offered as single quarter intensives during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

		quarter hours
23.509,	23.510 Western Civ. A, B	6
30.603	Composition & Rhetoric	4
30.606	Introduction to Literary Forms	4
41.541	Accounting Principles	6
45.608	Quality Control	4
45.643	Law	6
45.648	Electronic Data Processing	6
45.652	Management and Organization	6
45.690	Labor Management Relations	4
45.692	Quality Control	6

*Upper level Business Administration course—see page 57.
**Course substitutions may not be affected.

INSURANCE — Bachelor of Science Degree

				quarter hours	
Associate Degree Program					**96**
Core Courses—Liberal Arts					
21.501,	21.502,	21.503	Sociology I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
	39.517,	39.518	Money and Banking I, II	4	
		39.519	Public Finance	2	**18**
Core Courses—Business Administration					
	44.511,	44.512	Life Insurance I, II	4	
44.514,	44.515,	44.516	Property and Casualty Insurance I, II, III	6	
45.541,	45.542,	45.543	Law I, II, III*	6	**16**
Major Concentration Courses					
		44.513	Estate Planning*	2	
	44.525,	44.526	Health and Social Insurance I, II*	4	
		44.527	Group Insurance and Pensions	2	
		44.529	Advanced Property Insurance*	2	
		44.530	Advanced Property—Casualty Insurance*	2	
		44.543	Law of Insurance*	2	**14**
Electives			Liberal Arts	4	
			Business Administration or Liberal Arts	26	**30**
			Total Credits		**174**

Additional Department Offerings

45.664,	45.665	EDP in Property and Casualty I, II	4	

The following courses are frequently offered as a single quarter intensive during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

21.601,	21.602	Principles of Sociology I, II	8**	
	45.643	Law	6	

Please see page 249 for course descriptions.

*Upper level Business Administration course—see page 57.
**Additional 2 quarter hours of credit may be applied to Liberal Arts electives.

MANAGEMENT — Bachelor of Science Degree

				quarter hours	
Associate Degree Program					**96**
Core Courses—Liberal Arts					
21.501,	21.502,	21.503	Sociology I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
30.511,	30.512,	30.513	Business Writing and Reports I, II, III	6	
39.531,	39.532,	39.533	Business Cycles I, II, III	6	**24**
Core Courses—Business Administration					
44.507,	44.508,	44.509	Corporate Finance I, II, III	6	
45.541,	45.542,	45.543	Law I, II, III*	6	**12**
Major Concentration Courses					
19.532,	19.533,	19.534	Industrial Psychology I, II, III*	6	
41.533,	41.534,	41.535	Accounting for Management Decisions I, II, III	6	
43.532,	43.533,	43.534	Marketing Management I, II, III*	6	
45.523,	45.524,	45.525	Management Seminar I, II, III*	6	
45.533,	45.534,	45.535	Management Decisions and Policies I, II, III*	6	**30**
Electives			Business Administration or Liberal Arts		**12**
			Total Credits		**174**

Additional Department Offerings

		45.577	Data Systems Administration	2
45.586,	45.587,	45.588	Systems Design and Techniques I, II, III	6
	45.603,	45.604	Administrative Management and Office Services I, II	4
	45.616,	45.653	Government Data Processing Applications I, II	4
	45.618,	45.619	Retail Data Processing Applications I, II	4
	45.655,	45.656	Auditing Data Processing Applications I, II	4
	45.661,	45.662	Banking Data Processing Applications I, II	4
	45.664,	45.665	EDP in Property and Casualty I, II	4
		45.667	Project Planning and Control	2
45.670,	45.671,	45.672	Management of Change I, II, III	6
		45.696	Principles and Practice of Management	2
	49.504,	49.505	Strategy for Planning I, II	6

Please see page 250 for course descriptions.

*Upper level Business Administration course—see page 57.

The following courses are frequently offered as single quarter intensives during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

21.601,	21.602	Principles of Sociology I, II	8**
	41.543	Accounting for Management Decisions	6
	44.505	Corporate Finance	6
	45.643	Law	6

**Additional 2 quarter hours of credit may be applied towards Liberal Arts electives.

MANAGEMENT INFORMATION SYSTEMS

Bachelor of Science Degree

				quarter hours	
Associate Degree Program					**96**
Core Courses—Liberal Arts					
21.501,	21.502,	21.503	Sociology I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
30.511,	30.512,	30.513	Business Writing and Reports I, II, III	6	**18**
Core Courses—Business Administration					
43.501,	43.502,	43.503	Introduction to Marketing I, II, III	6	
44.507,	44.508,	44.509	Corporate Finance I, II, III	6	
	45.511,	45.512	Human Relations in Organizations I, II	4	
45.541,	45.542,	45.543	Law I, II, III*	6	
	45.610,	45.611	Labor Management Relations I, II	4	**26**
Major Concentration Courses					
45.589,	45.590,	45.591	Advanced Systems Design I, II, III*	6	
45.592,	45.593,	45.594	Advanced Systems Techniques I, II, III*	6	
		45.630	Introduction to Operations Research	2	
	45.631,	45.632	Operations Research Applications I, II*	4	
	45.668,	45.669	Peripheral Systems Techniques I, II	4	**22**
Electives			Liberal Arts	2	
			Business Administration or Liberal Arts	10	**12**
			Total Credits		**174**

Additional Department Offerings

45.685,	45.686,	45.687	Computer Programming for Scientific Applications I, II, III	6
	45.616,	45.653	Government Data Processing Applications I, II	4
45.617,	45.618,	45.619	Advanced Comp. Programming I, II, III	6
	45.655,	45.656	Audit. Data Processing Applications I, II	4
	45.658,	45.659	Retail Data Processing Applications I, II	4
	45.661,	45.662	Banking Data Processing Applications I, II	4
	45.664,	45.665	EDP in Property and Casualty Insurance I, II	4
45.677,	45.678,	45.679	Operating Systems I, II, III	6
45.680,	45.681,	45.682	Computer Communications Systems I, II, III	6
	45.697,	45.698	Information Processing in Medicine	4
		49.530	Privacy and Security	2
		49.531	Data Base Management	2
49.532,	49.533,	49.534	Mini Computers I, II, III	6
	49.504,	49.505	Strategy for Planning I, II	6

Please see page 263 for course descriptions.

*Upper level Business Administration course—see page 57.

The following courses are frequently offered as single quarter intensives during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

21.601,	21.602	Principles of Sociology I, II	8**
	43.504	Introduction to Marketing	6
	44.505	Corporate Finance	6
	45.641	Human Relations in Organization	4
	45.643	Law	6
	45.690	Labor Management Relations	4
	49.535	Auditing Data Processing	4
	45.690	Labor Management Relations	4

**Additional 2 quarter hours of credit may be applied towards Liberal Arts electives.

MARKETING — Bachelor of Science Degree

				quarter hours	
Associate Degree Program					**96**
Core Courses—Liberal Arts					
21.501,	21.502,	21.503	Sociology I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	**12**
Core Courses—Business Administration					
43.518,	43.519,	43.522	Retailing & Mass Merchandising I, II, III	6	
45.541,	45.542,	45.543	Law I, II, III*	6	**12**
Major Concentration Courses					
43.507,	43.508,	43.509	Sales Management I, II, III	6	
		43.520	Industrial Marketing	2	
	43.525,	43.526	Market Research I, II*	4	
		43.529	International Marketing	2	
43.532,	43.533,	43.534	Marketing Management I, II, III*	6	
		43.537	Marketing and Sales Seminar*	2	
43.546,	43.547,	43.548	Advertising and Sales Promotion Management I, II, III	6	**28**
Electives			Liberal Arts	10	
			Business Administration or Liberal Arts	16	**26**
			Total Credits		**174**

Additional Department Offerings

		43.530	Consumer Behavior Seminar	2
		43.536	Introduction to Advertising	2
	43.541,	43.542	Public Relations I, II	4
	43.543,	43.544	Salesmanship I, II	4
		43.545	Product Management and Development	2
		45.577	Data Systems Administration	2
	45.618,	45.619	Retail Data Processing Applications I, II	4
45.685,	45.686,	45.687	Computer Programming for Scientific Applications I, II, III	6
	49.504,	49.505	Strategy for Planning I, II	6
		49.506	Consumer Education	2

Please see page 241 for course descriptions.

The following courses are frequently offered as a single quarter intensive during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

21.601,	21.602	Principles of Sociology I, II	8**
	45.643	Law	6

*Upper level Business Administration course—see page 57.
**Additional 2 quarter hours of credit may be applied towards Liberal Arts electives.

PERSONNEL AND INDUSTRIAL RELATIONS

Bachelor of Science Degree

				quarter hours	
Associate Degree Program					**96**
Core Courses—Liberal Arts					
21.501,	21.502,	21.503	Sociology I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	**12**
Core Courses—Business Administration					
45.541,	45.542,	45.543	Law I, II, III*	6	**6**
Major Concentration Courses					
45.513,	45.514,	45.515	Personnel Management I, II, III	6	
		45.517	Techniques of Employee Selection	2	
		45.518	Wage and Salary Administration*	2	
		45.521	Employee Benefits and Social Security	2	
		45.522	Job Evaluation	2	
		45.545	Law of Employment Standards*	2	
		45.546	Law of Employment Conditions*	2	
		45.548	Law of Labor Management Relations*	2	
		45.553	The Labor Agreement*	2	
		45.556	Negotiation, Mediation, Arbitration*	2	
		45.560	Seminar on Labor Issues*	2	**26**
Electives			Liberal Arts	10	
			Business Administration or Liberal Arts	24	**34**
			Total Credits		**174**

Additional Department Offerings

		45.552	Advanced Human Relations	2
45.670,	45.671,	45.672	Management of Change I, II, III	6
		45.691	Creative Problem Solving	2
49.536,	49.537,	49.538	Group Dynamics I, II, III	6
		49.539	International Labor Relations	2
	49.504,	49.505	Strategy for Planning I, II	6

Please see page 257 for course descriptions.

The following courses are frequently offered as single quarter intensives during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

21.601,	21.602	Principles of Sociology I, II	8**
	45.607	Personnel Management	6
	45.643	Law	6

*Upper level Business Administration course—see page 57.
**Additional 2 quarter hours of credit may be applied towards Liberal Arts electives.

TRANSPORTATION AND PHYSICAL DISTRIBUTION MANAGEMENT — Bachelor of Science Degree

				quarter hours	
Associate Degree Program					**96**
Core Courses—Liberal Arts					
21.501,	21.502,	21.503	Sociology I, II, III	6	**6**
Core Courses—Business Administration					
43.532,	43.533,	43.534	Marketing Management I, II, III	6	
45.533,	45.534,	45.535	Management Decisions & Policies I, II, III	6	
45.541,	45.542,	45.543	Law I, II, III	6	
48.514,	48.515,	48.516	Elements of Transportation and Distribution I, II, III	6	**24**
Major Concentration Courses—Students specializing in the Management of Transportation companies:					
		45.553	The Labor Agreement	2	
		45.556	Negotiations, Mediation, Arbitration	2	
45.670,	45.671,	45.672	Management of Change I, II, III	6	
48.534,	48.535,	48.536	Surface Transportation I, II, III	6	
		48.537	Surface Transportation IV	2	
48.541,	48.542,	48.543	Air Transportation Management I, II, III	6	
	48.547,	48.548	Urban Transportation I, II	4	
		48.549	Seminar in Selected Topics	2	
		48.600	Seminar in Northeast Corridor Transportation	2	**32**
Electives			Liberal Arts	10	
			Business Administration	6	**16**
			Total Credits		**174**
Major Concentration Courses—Students specializing in Physical Distribution Management:					
		45.526	Facilities Planning and Design I	2	
45.537,	45.538,	45.539	Purchasing I, II, III	6	
	45.636,	45.637	Production and Inventory Control I, II	4	
45.638,	45.639,	45.640	Industrial Decision Making I, II, III	6	
48.504,	48.505,	48.506	Transportation Regulation and Promotion I, II, III	6	
48.527,	48.528,	48.529	Traffic Management I, II, III	6	
		48.537	Surface Transportation IV	2	
		48.538	Management of Warehouse Operations	2	
		48.539	Organization and Control of Physical Distribution Management	2	
		48.540	Management Science & Physical Distribution Management	2	

	48.549	Seminar in Selected Topics	2	**40**
Electives		Liberal Arts		**8**
		Total Credits		**174**

The following courses are frequently offered as single quarter intensives during the regular school year. Please refer to the current Schedule of Courses and Registration Guide for details.

21.601,	21.602	Principles of Sociology I, II	8**
	45.550	Purchasing	6
	45.643	Law	6
	45.680	Production and Inventory Control	4

Please see page 272 for course descriptions.

**Additional 2 quarter hours of credit may be applied towards Liberal Arts electives.

COMBINED PROGRAM IN LIBERAL ARTS AND MANAGEMENT — Bachelor of Science Degree

LIBERAL ARTS COURSES

Basic Courses				quarter hours	
10.327,	10.328,	10.329	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6**	
23.501,	23.502,	23.503	Western Civilization I, II, III	6**	
	30.601,	30.602	Composition and Rhetoric I, II	4**	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6**	32
				—	
Core Courses					
16.501,	16.502,	16.503	Earth Science I, II, III	6**	
21.501,	21.502,	21.503	Sociology I, II, III	6**	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
23.504,	23,505,	23.506	American History I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6**	
39.511,	39.512,	39.513	Statistics I, II, III	6**	
Fine Arts:			Art, Music or Theatre Arts	6	
Literature			English, American, or other in Translation	6	48
				—	
Electives			Literature	4	
			Liberal Arts	18	22
				—	

MANAGEMENT COURSES

Core Courses					
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
43.501,	43.502,	43.503	Introduction to Marketing I, II, III	6	
44.501,	44.502,	44.503	Finance and Risk Management I, II, III	6	
44.507,	44.508,	44.509	Corporate Finance I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
	45.511,	45.512	Human Relations in Organizations I, II	4	
45.541,	45.542,	45.543	Law I, II, III*	6	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	
	45.610,	45.611	Labor Management Relations I, II	4	50
				—	
Electives			Business Administration		22
					—
			Total Credits		174

*Upper level Business Administration course—see page 57.

**These Liberal Arts courses and all of the MANAGEMENT COURSES listed above are frequently offered as single quarter intensives during the regular school year. Please refer to the current schedule of Courses and Registration Guide for details. Any Liberal Arts courses taken as intensive for 8 quarter hours of credit will permit applying the additional 2 quarter hours to the Liberal Arts electives.

liberal arts

Harold Naidus, Associate Dean
Director, Liberal Arts Programs
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Aims

In providing the means to a modern liberal education, University College has the main objective of stimulating and guiding the self-development of the student in three main areas: first, his intellectual growth; second, the development of his character and sense of values; and third, his preparation for, or advancement in, a career.

Intellectual growth—the development of the ability to think independently and creatively—rests upon the foundation of a sound general education. Through the liberal arts curricula, students are guided toward an appreciative understanding of the active discovery of ideas and methods in the areas of humanities, natural science, and social science. With this training, the student can more fully realize the basic values upon which civilization rests and can more fully participate in the intellectual, moral, and material achievement of that civilization.

Through its many programs, University College endeavors to provide experiences conducive to the development of strength of character and a sense of personal responsibility, including such personal qualities as self-reliance, integrity, perseverance, and the ability to work with others.

University College holds that there is no inconsistency between a truly liberal education and preparation for a vocation. As an adventure in intellectual discovery, a liberal education leads to the broadening and intensification of interests as the student becomes aware of his own mental strengths and weaknesses. This discovery is essential for making more intelligent and realistic appraisals of himself and his career. His career brings meaning and focus to his educational experience. His education presents both a challenge to accept responsibility and an opportunity to seek knowledge and skills for himself.

Methods

To enable each student to plan a college program in keeping with his own interests and aptitudes, a wide range of electives is offered. This

does not mean that students are free to elect courses indiscriminately, for if they are to obtain a liberal education they must have training in several basic fields.

Therefore, the Curriculum Committee of University College has established basic minimum requirements in each of several fields. These distribution requirements are outlined with each of the program offerings.

Bachelors Degrees

Bachelor of Arts

Matriculating students must indicate their choice of degree programs, if the major department offers the option.

Major fields of study are offered in Economics, English, Art, Political Science, History, Psychology, Sociology-Anthropology, and Music. Students should choose their major field of study and their electives in consultation with a program adviser.

The distribution requirements, including specific required courses are shown with each curriculum.

Each curriculum normally provides for not less than 174 quarter hours of work, including at least 40 quarter hours of advanced work in a major field, and at least 30 quarter hours of elective liberal arts courses.

All candidates for the Bachelor of Arts degree must have satisfactorily completed in college one full year of a modern language beyond the elementary level, 4 quarter hours of Composition and Rhetoric and 4 quarter hours of Introduction to Literary Forms.

No student transferring from another college or university is eligible to receive a degree, until at least 46 quarter hours of academic work have been completed at Northeastern University immediately preceding graduation.

New Bachelor of Science

Some departments have elected to offer a **new** B.S. degree, the requirements for which are listed after the B.A. degree in the following pages (unless otherwise stated, the requirements are the same as for the B.A. degree).

Chemical-Biological Technology Programs

Recognizing the need for technicians and technologists in modern society, University College offers the following programs (formerly in Lincoln College):

Chemical-Biological Technology (A.S.) page 105.
Chemical-Biological Technology (B.S.) page 106.

The Associate in Science Degree

The program leading to the Associate degree is offered for those desiring a general cultural background in the liberal arts and humanities, but who do not wish to pursue a major field of concentration for the baccalaureate degree.

Candidates for the Associate in Science degree in Liberal Arts must complete a minimum of 96 quarter hours of credit. This is approximately one half of the requirements (174 quarter hours) for the Bachelor of Science degree.

To provide a balanced program which will achieve the established objectives, the faculty has set a minimum credit requirement in the several areas of study as listed under each major.

Distribution Requirements

For the purpose of satisfying the distribution requirements in all Liberal Arts Majors:

Math-Science includes only courses in Mathematics (10....), Physics (11....), Chemistry (12....), Earth Science (16....), Biology (18....), and Psychology (lab. courses only) (19....).

Humanities includes only courses in Art (27....), Speech and Theatre Arts (29....), English (except *required*) (30....), Journalism (38....), Modern Languages (except required elementary or conversational) (31.... to 34....), Philosophy (26....), and Music (28....).

Social Sciences includes only courses in Economics (39....), History (23....), Political Science (22....), Psychology (except laboratory courses) (19....), Social Welfare (25....), and Sociology-Anthropology (20.... and 21....).

English Requirement

The 8 quarter hours of *required* English* must be taken prior to matriculation. These are required courses which cannot be used to satisfy distribution requirements in any liberal arts course of study.

30.601, 30.602, (or 30.603) Composition and Rhetoric I, II, (or Intensive) 4 q.h.
30.604, 30.605, (or 30.606) Introduction to Literary Forms I, II (or Intensive) 4 q.h.

*For new English requirements see explanation on p. 220.

Honors Program

An upperclass honors program is provided in University College to enable superior students to develop their potential to the highest degree by making it possible for them to pursue studies in their major fields to greater depth than is possible in the regular courses.

The nature of the program is determined by the academic department concerned. Programs may involve any of the following elements: special research projects culminating in honor theses, seminars, reading projects, directed independent study, or creative work. Flexibility is the keynote, with every consideration given to the individual needs and requirements of the student.

Students who have earned 96 quarter hours of credit toward their Bachelor's degree and who have a grade-point average of 3.0 or better are eligible to apply to the Director of Liberal Arts in University College for admission to the program. Acceptance as an honors candidate rests with the academic department concerned.

Acceptance of Credits by the College of Liberal Arts*

The College of Liberal Arts permits its students to enroll for credit in all courses in University College offered on a quarterly basis, when they are pertinent to the student's program and have been approved by the Dean of the College of Liberal Arts. The credits for such courses may be applied:

1. To the total number of credits needed for graduation
2. To satisfy distribution requirements
3. To fulfill language and major deficiencies

Credits from University College, as well as those from other accredited institutions, may not be applied to the quality point average of students in the College of Liberal Arts except when such credits are from courses taken as substitutes for those College of Liberal Arts courses failed by students. In such instances students must receive a grade of C or better in the University College courses and then only 2.0 quality points are applied to the student's record for each course. Courses taken in University College which are not offered in the Liberal Arts College, may be transferred with the full grade upon approval of the major department.

Transfer of Students to the College of Liberal Arts*

Those students enrolled in University College who wish to transfer to the College of Liberal Arts must apply through the Department of Admissions of the Basic Colleges.

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*One of the Basic (day) Colleges of Northeastern University.

Advanced Standing Credit—Credit for Non-Collegiate Experience (NCE)

A matriculated Liberal Arts student with a departmental major in University College may obtain up to 16 quarter hours of credit (excluding CLEP credit) for knowledge acquired in a non-traditional manner.

The student will petition his major adviser (with a copy to the Director of Admissions) for such credit, listing the Liberal Arts course(s), as well as the reasons, for which he feels he should receive credit. He may also petition for credit for subject matter which has no counterpart course in University College. The major adviser will contact the consultant of the appropriate Liberal Arts department to arrange for an appraisal of the student's credentials. At the discretion of the department, this appraisal may or may not include a formal examination. Upon receipt of the consultant's recommendation, the student may request the Director of Admissions to inform him of the status of his petition.

In order to plan their last year and to expedite the evaluation of their petition for NCE credit, students planning to graduate during a particular year are urged to submit petitions prior to June 1 of the year preceding graduation. No petitions can be considered after February 1 for June graduation or after March 1 for September graduation.

In no case will this credit be considered as partial fulfillment of the residence requirement nor will a grade be assigned.

No credit will be assigned in this manner for courses which can be accredited through the CLEP testing program at the time of the petition.

Wherever possible, credit will be assigned for specific courses.

It is possible that this credit may be applicable toward a degree in University College only.

Field Work Courses

To provide the opportunity for a student to apply his academic background to practical problems, several departments have introduced courses in their curriculum entitled "Field Work in . . . ."

A field work course shall have the following characteristics (as voted by the Curriculum Committee):

1. It shall be a one quarter course worth six quarter hours of credit.
2. Only matriculated majors within the department offering the course may register.
3. The prerequisites shall be departmentally established.

4. Each student shall make his own arrangement for carrying on suitable field work at a departmentally acceptable organization involving departmentally acceptable field work experience(s). The department will participate in student placement only in an advisory capacity.
5. Each student shall spend a minimum of fifteen hours per week at the outside organization on a volunteer or paid basis.
6. Each student shall meet with the departmental field work adviser as frequently as the adviser feels necessary but, in any case, no fewer than three times per quarter (once to formulate the program of field work experience, once to discuss ongoing work and once to transmit and discuss the final written report).
7. The student's grade shall be dependent upon both the quality of the experience as demonstrated in the final report and the discussions between the U.C. field work adviser and the outside supervisor.
8. So long as one student registers, the course will not be cancelled.
9. The outside supervisor will be offered a transferrable voucher for a tuition-free course at Northeastern University.

Prior to registration, each student should consult with his major department.

All field work courses will be numbered as follows: —.699.

ECONOMICS — Bachelor of Arts Degree

(Students who matriculated prior to September 1973 must petition the UC Admissions Office for this degree.)

Distribution Requirements—(see page 85 for courses included in the three categories listed below:)

	quarter hours	
Math-Science	16	
Humanities	24	
Social Sciences	24	**64**

Liberal Arts Program Requirements

*30.601,	30.602	(or 30.603)	Composition & Rhetoric I, II (or Intensive)	4	
*30.604,	30.605	(or 30.606)	Introduction to Literary Forms I, II (or Intensive)	4	
Modern Language:			Elementary or Conversational	12	
			Intermediate	12	**32**

Major Concentration Courses—required

39.507,	39.508,	39.509	Intermediate Economic Theory I, II, III	6	
39.511,	39.512,	39.513	Statistics I, II, III	6	
	39.517,	39.518	Money and Banking I, II	4	
		39.519	Public Finance	2	
		39.521	Economic Growth and Development I	2	
		39.523	Government and Business I	2	
		39.527	Labor Economics	2	
	39.528,	39.529	International Economics I, II	4	
		39.530	Comparative Economic Systems	2	
	39.531,	39.532	Business Cycles I, II	4	
		39.581	Economic Policy Seminar	2	

The remaining twelve hours must be taken from the following courses:

		39.522	Economic Growth and Development II	2	
	39.524,	39.526	Government and Business II, III	4	
		39.525	American Economic History	2	
		39.533	Business Cycles III	2	
39.536,	39.537,	39.538	Advanced Statistics I, II, III	6	
		39.539	Managerial Economics	2	
		39.540	History of Economic Thought	2	
		39.551	Industrial Organization	2	
		39.561	Urban Economics	2	
		39.571	European Economic History	2	**48**
Elective**					**30**
		Total Credits			**174**

Bachelor of Science Degree

(None offered at this time.)

*These must be completed prior to matriculation.

**While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

ENGLISH — Bachelor of Arts Degree

Distribution Requirements—(see page 85 for courses included in the three categories listed below:)

	quarter hours	
Math-Science	16	
Humanities	24	
Social Sciences	24	**64**

Liberal Arts Program Requirements

*30.601,	30.602	(or 30.603)	Composition & Rhetoric I, II (or Intensive)	4	
*30.604,	30.605	(or 30.606)	Introduction to Literary Forms I, II (or Intensive)	4	
Modern Language:			Elementary or Conversational	12	
			Intermediate	12	**32**

Major Concentration Courses—required
Preliminary Courses—all courses required

30.541,	30.542,	30.543	English Literature I, II, III	6	
30.544,	30.545,	30.546	American Literature I, II, III	6	
		30.517	Intermediate Writing	2	**14**

Major Figures in English Literature—three courses required

30.551,	30.552,	30.553	Chaucer I, II, III	6	
		30.561	Spenser	2	
30.554,	30.555,	30.556	Shakespeare I, II, III	6	
		30.562	Milton	2	**6**

Major Periods in English Literature—six courses required

		30.557	The 17th Century	2	
	30.558,	30.559	The 18th Century I, II	4	
30.571,	30.572,	30.573	The 19th Century I, II, III	6	
30.574,	30.575,	30.576	The 18th-Century English Novel The 19th-Century English Novel The 20th-Century English Novel	6	**12**

American Literature—three courses required

30.581,	30.582,	30.583	The American Short Story; The 19th-Century American Novel The 20th-Century American Novel	6	
		30.578	Afro-American Literature	2	
		30.584	Contemporary American Poetry	2	**6**

(Continued on opposite page)

*These must be completed prior to matriculation.

Literature in Translation—three courses required

30.531,	30.532,	30.533	Western World Literature I, II, III	6	
30.534,	30.535,	30.536	Western World Literature IV, V, VI	6	**6**

English Electives **8**

Open Electives. These may include 30.591, 30.592, 30.593 Honors Programs I, II, III **26**

Total Credits **174**

Bachelor of Science Degree

Unless otherwise stated, requirements are the same as for the B.A. degree.

Modern Language	None	
English Electives		**16**
Open Electives		**42**

FINE ARTS — Bachelor of Arts Degree

Distribution Requirements—(see page 85 for courses included in the three categories listed below:)

	quarter hours	
Math-Science	16	
Humanities	24	
Social Sciences	24	**64**

Liberal Arts Program Requirements

*30.601,	30.602	(or 30.603)	Composition & Rhetoric I, II (or Intensive)	4	
*30.604,	30.605	(or 30.606)	Introduction to Literary Forms I, II (or Intensive)	4	
Modern Language:			Elementary or Conversational	12	
			Intermediate	12	**32**

Major Concentration Courses—required

27.504,	27.505,	27.506	History of Art I, II, III	6	

In addition to History of Art I, II, III required of all Fine Arts majors, each student will select a minimum of 38 quarter hours in Area I or 39 quarter hours in Area II. (See page 92)

Bachelor of Science Degree

Unless otherwise stated, requirements are the same as for the B.A. degree.

Modern Language	None	
Electives		**58**

(Continued on following page.)

*These must be completed prior to matriculation.

Area I—Art History Major

		27.507	Ancient Architecture	2
		27.508	Medieval and Renaissance Architecture	2
		27.509	European Architecture	2
	27.510,	57.511	Ancient Painting and Sculpture I, II	4
		27.512	Medieval Painting and Sculpture	2
		27.514	European Painting	2
	27.515,	27.516	Modern Painting I, II	4
		27.518	20th-Century American Architecture	2
		27.519	20th-Century European Architecture	2
		27.520	Italian Renaissance Art II	2
		27.522	French Painting	2
		27.523	English Art	2
27.524,	27.525,	27.526	American Art I, II, III	6
		27.535	African Art	2
		27.536	Latin American Art	2
		27.538	Chinese Art	2
		27.539	Japanese Art	2
		27.547	European Graphic Arts	2
		27.560	Oriental Indian Art	2
27.587,	27.588,	27.589	History of Photography I, II, III	6
		27.592	New York Art Seminar	2
		27.594	European Art Seminar	2
27.597,	27.598,	27.599	History and Technique of Film I, II, III	6
27.600,	27.601,	27.602	Honors Program I, II, III	12
		27.603	Mexican Art	2

Required:

Area II—Studio Art Major

27.541,	27.542,	27.543	Drawing I, II, III	9
27.561,	27.562,	27.563	Basic Color and Design I, II, III	9

Twenty one quarter hours must be taken from the following courses:

27.527,	27.528,	27.529	Life Drawing I, II, III	9
27.544,	27.545,	27.546	Graphic Arts I, II, III	9
27.551,	27.552,	27.553	Painting—Basic Level I, II, III	9
27.554,	27.555,	27.556	Painting—Advanced Level I, II, III	9
27.557,	27.558,	27.559	Advanced Graphic Arts I, II, III	9
		27,564	Advanced Color and Design	3
27.571,	27.572,	27.573	Basic Commercial Design I, II, III	9
		27.574	Advanced Commercial Design	3
27.600,	27.601,	27.602	Honors Program I, II, III	12
				44-45
Electives*				**34**
			Total Credits	**174**

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

HISTORY — Bachelor of Arts Degree

Distribution Requirements—(see page 85 for courses included in the three categories listed below:)

	quarter hours	
Math-Science	16	
Humanities	24	
Social Sciences	24	**64**

Liberal Arts Program Requirements

*30.601,	30.602	(or 30.603)	Composition & Rhetoric I, II (or Intensive)	4	
*30.604,	30.605	(or 30.606)	Introduction to Literary Forms I, II (or Intensive)	4	
Modern Language			Elementary or Conversational	12	
			Intermediate	12	**32**

Major Concentration Courses—required

History majors are required to take 6 quarter hours of Western Civilization (23.501, 23.502, 23.503) and 6 quarter hours of the American History survey (23.504, 23.505, 23.506). These 12 credits are applicable to the social science distribution requirements for History majors. **12**

Required in addition are 40 quarter hours of history courses to be distributed as follows:

	quarter hours	
23.500 Historian's Craft	4	
At least 6 quarter hours in each of the following four areas:		
I. Ancient Medieval, and Early Modern Europe		
II. Modern and Contemporary Europe		
III. American History		
IV. Other Regions	24	
(See specific History courses at back of catalog for area designations.)		
The remaining 12 quarter hours of history may be chosen from any of the above four areas. Students in the Honors Program (23.597, 23.598, 23.599) may use these 12 quarter hours.	12	**40**

Since September, 1972, some history courses carry 4 quarter hours of credit and may meet twice weekly.

Electives** **26**

Total Credits **174**

(Continued on following page.)

*These must be completed prior to matriculation.
**While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

Bachelor of Science Degree

(Unless otherwise stated, requirements are the same as for the B.A. degree)

Distribution Requirements—

	quarter hours
Math-Science	None
Humanities	24
Social Sciences	None
Modern Language	None

Other Required Courses— **30**

39.501,	39.502,	39.503	Economic Princ. & Problems I, II, III	6
39.511,	39.512,	39.513	Statistics I, II, III	6
21.501,	21.502,	21.503	Sociology I, II, III	6
21.512,	21.513,	21.514	Social Research Methods I, II, III	6
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6

Electives **60**

LIBERAL ARTS — Associate in Science Degree

			quarter hours	
Math—Science*			16	
Humanities*			24	
Social Sciences*			24	
30.601,	30.602	Composition and Rhetoric I, II	4	
30.604,	30.605	Introduction to Literary Forms I, II	4	72
Electives				24
		Total Credits		96

*See page 85 for courses included in the various designations.

POLITICAL SCIENCE — Bachelor of Arts Degree

Distribution Requirements—(see page 85 for courses included in the three categories listed below):

	quarter hours	
Math-Science	16	
Humanities	24	
Social Sciences	24	**64**

Liberal Arts Program Requirements

*30.601,	30.602	(or 30.603)	Composition & Rhetoric I, II (or Intensive)	4	
*30.604,	30.605	(or 30.606)	Introduction to Literary Forms I, II (or Intensive)	4	
Modern Language:			Elementary or Conversational	12	
			Intermediate	12	**32**

Major Concentration Courses—required (see page 96)

Prerequisites: Principles of Political Science I, II, III (22.501, 22.502, 22.503) which may be taken out of sequence if necessary, or Principles of Political Science (Intensive) (22.507).

Bachelor of Science Degree

Unless otherwise stated, requirements are the same as for the BA degree

Distribution Requirements	None
Modern Language	None

Additional Requirements—

Statistics	10.316	10.317	10.318	6
		Or		
	19.504	19.505	19.506	
		Or		
	39.511	39.512	39.513	
Computer Techniques and Programming				
	45.570	45.571	45.572	6
	45.599			2
Other Electives				to a total of **174**

(Continued on following page)

*These must be completed prior to matriculation.

Each student will select a minimum of 6 quarter hours from each of the following four areas, as indicated:

		quarter hours
Area I—American Government		
22.511	American National Government	2
any additional **two** courses from among:		4
22.512	Urban and Metropolitan Government	2
22.514	American Constitutional Law	2
22.515	Civil Rights	2
22.516	Public Administration I	2
22.517	Public Administration II	2
22.518	Government and Politics of States	2
22.519	The Legislative Process	2
22.520	The American Presidency	2
22.551	Current Political Issues	2
22.570	Consumer Advocacy I	2
22.571	Consumer Advocacy II	2
22.572	Consumer Advocacy III	2
Area II—Comparative Government		
22.521	Comparative Government I	2
22.522	Comparative Government II	2
any additional **one** course from among:		2
22.537	European Political Parties	2
22.544	Government and Politics in the Soviet Union I	2
22.545	Government and Politics in the Soviet Union II	2
22.547	Government and Politics of Communist China I	2
22.548	Government and Politics of Communist China II	2
22.552	Government and Politics of the Middle East I	2
22.553	Government and Politics of the Middle East II	2
22.555	Government and Politics in Latin America I	2
22.556	Government and Politics in Latin America II	2
22.558	Government and Politics of Southeast Asia	2
22.559	Government and Politics of Japan	2
22.560	Politics and Policies of Developing Nations I	2
22.561	Politics and Policies of Developing Nations II	2
22.562	Government and Politics of Sub Saharan Africa	2
22.563	Government and Politics of Northern Africa	2

Area III—International Relations

22.535	International Relations (not to be taken by students who have credit for 22.531)	4
any additional **one** course from among:		2
22.532	International Organization	2
22.534	Soviet Foreign Policy	2
22.538	Communist China's Foreign Policy	2
22.541	International Law	2
22.533	American Foreign Policy	2
22.542	American Foreign Policy I	2
22.543	American Foreign Policy II	2
22.564	Communism in Eastern Europe I	2
22.565	Communism in Eastern Europe II	2

Area IV—Theory and Methodology

22.536	Introduction to Political Theory (not to be taken by students who have credit for 22.504)	4
any additional **one** course from among:		2
22.505	Contemporary Political Theory	2
22.506	American Political Thought	2
22.508	Research Methods	2

Political Science Electives. A total of 18 quarter hours of elective courses from any or all of the above areas, and may include the maximum number of quarter hours credit for Honors permitted by the College. **18**

Open Electives. Social Sciences other than Political Science, including not fewer than 6 quarter hours of each of three different disciplines selected from Economics, History, Psychology, and Sociology-Anthropology. **18**

Other Electives **18**

Total Credits **174**

PSYCHOLOGY — Bachelor of Arts Degree

Distribution Requirements—(see page 85 for courses included in the three categories listed below:)

		quarter hours
Math-Science	16	
Humanities	24	
**Social Sciences	24	**64**

Liberal Arts Program Requirements

*30.601, 30.602 (or 30.603)	Composition & Rhetoric I, II or (Intensive)	4
*30.604, 30.605 (or 30.606	Introduction to Literary Forms I, II (or Intensive)	4
Modern Language:	Elementary or Conversational	12
	Intermediate	12 **32**

Major Concentration Courses (page 99)

Bachelor of Science Degree

Unless otherwise stated, requirements are the same as for the B.A. degree.

Distribution Requirements—

Math-Science	32
Humanities	None
Social Sciences	20
Modern Language	None

Major Concentration Courses—required

All of the following pairs:
19.514, 19.515; 19.538, 19.540; 19.549, 19.550; 19.580, 19.581

Psychology Electives (as listed on the following page) **28**

Electives to a total of **174**

(Continued on following page)

*These must be completed prior to matriculation.
**It is recommended that Psychology majors substitute 19.508 and 19.509—Fundamentals of Psychology I and II for 19.501, 502, and 503.

Major Concentration Courses—required

19.501,	19.502,	19.503	(or 19.507) Psychology I, II, III	6	
		OR			
19.508,	19.509		Fundamentals of Psychology I, II	8	
		OR			
19.518,	19.519		Foundations of Psychology I, II	8	
19.504,	19.505,	19.506	Statistics in Psychology I, II, III	6	
19.561,	19.562		Scientific Foundations of Psychology I, II	4	
19.571			Senior Seminar	2	
			THREE OF THE FOLLOWING PAIRS:		
19.514,	19.515		Personality I, II (Lab)		
19.538,	19.540		Learning I, II (Lab)	12	**30–32**
19.549,	19.550		Sensation and Perception I, II (Lab)	—	
19.580,	19.581		Physiological Psychology I, II (Lab)		

In addition to the courses listed above, required of all Psychology majors, each student will select a minimum of 24 hours from the following Psychology electives:

19.511,	19.512,	19.513	Developmental Psychology I, II, III	6	
19.523			Motivation	2	
19.524,	19.525		Social Psychology I, II	4	
19.532,	19.533,	19.534	Industrial Psychology I, II, III	6	
19.536			Psychology of Thought	2	
19.537			Psychology of Language	2	
19.545			Psychological Therapies	2	
19.541,	19.542,	19.543	Abnormal Psychology	6	
19.588			Drugs and Behavior	2	
19.589			Impact of Psychology on Society	2	
19.591,	19.592,	19.593	Honors Program I, II, III	12	**24**
				—	

Electives* to a total of **174**

Total Credits **174**

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

SOCIOLOGY-ANTHROPOLOGY — Bachelor of Arts Degree

Distribution Requirements—(see page 85 for courses included in the three categories listed below:)

	quarter hours	
Math-Science	16	
Humanities	24	
Social Sciences	24	**64**

Liberal Arts Program Requirements

*30.601, 30.602 (or 30.603)	Composition & Rhetoric I, II (or Intensive)	4
*30.604, 30.605 (or 30.606)	Introduction to Literary Forms I, II (or Intensive)	4
Modern Language:	Elementary or Conversational	12
	Intermediate	12 **32**

Bachelor of Science Degree

Unless otherwise stated, requirements are the same for the B.A. degree.

Distribution Requirements—

Math-Science	None
Humanities	None
Social Sciences (other than soc-anthro.)	24
Modern Language	None

For those anticipating work in applied social welfare, it is highly recommended that at least elementary or conversational courses in an appropriate language be mastered.

Major Concentration Requirements

Same as for the B.A. degree plus at least 10 additional quarter hours of advanced courses, of which 4 quarter hours should be in anthropology.

Electives **78**

(Students are encouraged to elect math-science and humanities for adequate educational breadth.)

For students planning to attend graduate school, the B.A. degree is recommended.

*These must be completed prior to matriculation.

Major Concentration Courses—required				quarter hours
20.501,	20.502,	20.503	Anthropology I, II, III	6
21.501,	21.502,	21.503	Sociology I, II, III	6
21.512,	21.513,	21.514	Social Research Methods I, II, III	6
21.517,	21.518,	21.519	Social Theory I, II, III	6

The student may choose to substitute for any of the course sequences above more intensive versions under the following numbers and titles:

20.601,	20.602	Principles of Anthropology I, II	8
21.601,	21.602	Principles of Sociology I, II	8
21.612,	21.613	Social Research Methods I, II (Intensive)	8
21,617,	21.618	Social Theory I, II (Intensive)	8

The major is required to take 30 quarter hours of advanced courses from among the following offerings:

	20.521	Culture and Personality	2
	20.531	Primitive Social Organization	2
	20.532	Primitive Religion	2
	20.533	Acculturation	2
	20.537	Anthropological Theory	2
	20.541	North American Indian	2
	20.544	African Peoples and Culture	2
	20.547	Latin American Peoples and Culture	2
	20.548	Studying the Family Cross-Culturally	2
	20.549	Folklore	2
	20.550	Peasant Society and Culture as an Anthropological Problem	2
	20.551	The Comparative Study of Changing Peasantries	2
	20.552	Eastern European Peasantry in the Modern World	2
	20.560	Language and Culture	2
	21.505	Drugs and Society	2
	21.506	Sociology of Religion	2
	21.507	Sex in Society: The Study of Sex Roles	2
	21.508	Sociology of Literature	2
	21.509	Sociology of Socialist Societies	2
	21.528	Social Stratification	2
	21.531	Social Change	2
	21.534	Social Control	2
	21.535	Political Sociology	2
	21.546	Sociology of Deviant Behavior	2
	21.547	Social Problems	2
	21.550	Juvenile Delinquency	2
21.551,	21.552	Family and Marriage I, II	4

(Continued on next page)

21.553,	21.554,	21.555	Racial and Cultural Relations I, II, III	6	
		21.556	Sociology of Poverty	2	
		21.557	Urban Sociology	2	
		21.558	Community Analysis	2	
		21.559	Seminar in Urban Studies	2	
		21.560	Medical Sociology	2	
		21.561	Sociology of Mental Health	2	
		21.563	Social Gerontology	2	
		21.567	Population	2	
		21.570	Sociology of Occupations and Professions	2	
		21.573	Sociology of Industry	2	
		21.575	Sociology of Formal Organizations	2	
21.591,	21.592,	21.593	Honors Programs I, II, III	12	**54**
Electives*					**24**
			Total Credits		**174**

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

MUSIC — Bachelor of Arts Degree

Distribution Requirements—(see page 85 for courses included in the three categories listed below:)

	quarter hours	
Math-Science	16	
Humanities	24	
Social Sciences	24	**64**

Liberal Arts Program Requirements

*30.601,	30.602	(or 30.603)	Composition & Rhetoric I, II (or Intensive)	4	
*30.604,	30.605	(or 30.606)	Introduction to Literary Forms I, II (or Intensive)	4	
Modern Language:			Elementary or Conversational	12	
			Intermediate	12	**32**

Major Concentration Courses–required

28.599,	28.600,	28.601	Theory I, II, III	6	
28.605,	28.606,	28.607	Theory IV, V, VI	6	
28.608,	28.609,		Contrapuntal Techniques I, II	4	
28.534,	28.535,	28.536	Pedagogy of Music I, II, III	6	
28.602,	28.603,	28.604	Music History I, II, III	6	
28.528,	28.529,	28.530	Ear Training I, II, III	6	**34**

Major Concentration Electives (page 104)

Bachelor of Science Degree

Unless otherwise stated, requirements are the same as for the B.A. degree.

Distribution Requirements—	quarter hours	
Math-Science	7	
Humanities	24	
Social Sciences	24	
Modern Language:	12	**67**
Elementary or Conversational	—	

Electives (May include Honors Program, 28.695, 28.696, 28.697) **29**

(Continued on following page.)

*These must be completed prior to matriculation.

Major Concentration Courses—elective

Five of the following courses should be taken:

28.503	Women in Music	2	
28.510	Music and Art	2	
28.515	Contemporary Music	2	
28.517	Music as a Means of Social Expression	2	
28.520	Musical Forms	2	
28.521	The Symphony	2	
28.522	The Concerto	2	
28.523	Great Literature for Piano	2	
28.524	The World of Opera	2	
28.525	Contemporary Opera	2	
28.526	Jazz: Evolution and Essence	2	
28.531	Life and Works of J. S. Bach	2	
28.532	Life and Works of Mozart	2	
28.533	Life and Works of Beethoven	2	
28.543	Great Choral Literature	2	
28.544	Chamber Music	2	
28.545	Wagner's Ring Cycle	2	
28.546	Life and Works of Stravinsky	2	
28.547	The Music of Bruckner and Mahler	2	
28.548	Great Love Songs through the Ages	2	
28.549	A History of Musical Instruments in Western Culture	2	
28.550	Life and Works of Haydn	2	
28.551	Life and Works of Brahms	2	
28.552	Life and Works of Chopin	2	
28.553	Melodrama and the Macabre	2	
28.571	Piano Class I	2	
28.572	Piano Class II	2	
28.573	Piano Class III	2	
28.595	Opera Seminar	2	
28.587	Symphony Seminar	2	**10**

Free Electives **34**

Total Credits **174**

CHEMICAL-BIOLOGICAL TECHNOLOGY

Associate in Science Degree

The program in Chemical-Biological Technology provides the chemistry and biology foundation required by medical and industrial laboratory assistants and technicians in clinically, chemically, or biologically oriented organizations, and for persons having paramedical responsibilities. Employment opportunities are in hospitals, health clinics, research foundations, chemical and drug industries, public health organizations, water and sanitation departments, and in the emerging fields of the oceanographic technologies.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Basic Mathematics I and II courses (10.330 and 10.331). The Mathematics Placement Test must be taken prior to registration.

				quarter hours
First Year				
10.327,	10.328,	10.329	Mathematics I, II, III	6
			or	
10.307,	10.308		College Algebra & Trigonometry I, II	8
11.304,	11.305,	11.306	General Physics I, II, III	6
12.544,	12.545,	12.546	General Chemistry I, II, III	6
12.547,	12.548,	12.549	General Chemistry Lab. I, II, III	3
30.601,	30.602		Composition & Rhetoric I, II	4
			English Elective	2
Second Year				
10.316,	10.317,	10.318	Probability and Statistics I, II, III	6
			or	
10.320,	10.321,	10.322	Calculus I, II, III	8
			Social Science Elective I, II, III	6
18.511,	18.512,	18.513	Biology I, II, III	12
Third Year				
12.531,	12.532,	12.533	Organic Chemistry I, II, III	
12.534,	12.535,	12.536	Organic Chemistry Lab. I, II, III	
			or	12
12.521,	12.522,	12.523	Analytical Chemistry I, II, III	
12.524,	12.525,	12.526	Analytical Chemistry Lab. I, II, III	
18.524,	18.525,	18.526	Human Anatomy and Physiology I, II, III	9
			Humanities Elective I, II, III	6
Fourth Year				
18.521,	18.522,	18.523	Microbiology I, II, III	12
			Biology or Chemistry Elective I, II, III	6
			Total Credits	**96–100**

Note: Associate degree graduates may transfer applicable credits toward the requirements in Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degrees, as well as University College programs.

CHEMICAL-BIOLOGICAL TECHNOLOGY

Bachelor of Science Degree

The Chemical-Biological Technology program is an interdisciplinary program integrating theoretical and laboratory course sequences from the fields of chemistry and biology which prepare the student to assume responsibilities in laboratory careers which emphasize laboratory application and teaching careers in general science. Employment opportunities are in a wide variety of industrial, pharmaceutical, clinical, and hospital laboratories dealing with analytical, production, and research functions and in secondary school education in the teaching of general science, chemistry, biology, and other related courses.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Basic Mathematics I and II courses (10.330 and 10.331). The Mathematics Placement Test must be taken prior to registration.

First Year				**quarter hours**
10.316,	10.317,	10.318	Probability and Statistics I, II, III	6
			or	
10.307,	10.308		College Algebra & Trigonometry I, II	8
11.304,	11.305,	11.306	General Physics, I, II, III	6
12.544,	12.545,	12.546	General Chemistry I, II, III	6
12.547,	12.548,	12.549	General Chemistry Lab. I, II, III	3
30.601,	30.602		Composition and Rhetoric, I, II	4
			English Elective	2
Second Year				
10.316,	10.317,	10.318	Probability and Statistics I, II, III	
			or	8
10.320,	10.321,	10.322	Calculus I, II, III	
18.511,	18.512,	18.513	Biology I, II, III	12
23.501,	23.502,	23.503	Western Civilization I, II, III	6
Third Year				
12.521,	12.522,	12.523	Analytical Chemistry I, II, III	6
12.524,	12.525,	12.526	Analytical Chemistry Lab. I, II, III	6
18.524,	18.525,	18.526	Human Anatomy and Physiology I, II, III	9
19.501,	19.502,	19.503	Psychology I, II, III	6
Fourth Year				
12.531,	12.532,	12.533	Organic Chemistry I, II, III	6
12.534,	12.535,	12.536	Organic Chemistry Lab. I, II, III	6
18.521,	18.522,	18.523	Microbiology I, II, III	12
Fifth Year				
18.551,	18.552,	18.553	Histology-Organology I, II, III	6
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6
	12.551,	12.552	Instrumental Analysis I, II	4

	12.553		Radiochemistry	2
16.531,	16.532,	16.533	Oceanography I, II, III	6
Sixth Year				
18.561,	18.562,	18.563	Ecology I, II, III	6
12.541,	12.542,	12.543	Physical Chemistry I, II, III	6
			or	
12.515,	12.516,	12.517	Biochemistry I, II, III	6
21.501,	21.502,	21.503	Sociology I, II, III	6
			*Electives	6
Seventh Year				
	18.557,	18.558	Genetics I, II	4
	18.556		Genetics Lab.	2
30.604,	30.605		Introduction to Literary Form I, II	4
			English Elective	2
			*Electives as needed to complete Total Credits	
			Total Credits	**174**

*General Science Teacher Option—Students planning to apply to the Northeastern University Graduate School of Education must include courses in Adolescent Psychology and Principles of Teaching among the electives.

law enforcement

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Aims

Law Enforcement programs of study are offered to meet the needs of present and potential practitioners in the fields of corrections, law enforcement, and security who wish to acquire a liberal education as well as a professional competence, or to gain recognition for development and attainment while pursuing a career in that profession.

Methods

The distribution requirements, including certain required courses, are shown with each curriculum. Upon petition, students may be permitted under certain circumstances to substitute other courses which will more adequately serve their specific objectives.

To provide a balanced program which will achieve the established objectives, the faculty has set minimum requirements in the areas of study outlined on the following pages, with a recommended sequence of courses for each program.

Bachelor of Science Degree Program

Major fields of study are offered in Correctional Practices, Law Enforcement, and Security. Students should choose their major field of study and their electives in consultation with a program adviser.

Each curriculum provides for not less than 174 quarter hours of work, including at least 60 quarter hours of advanced work in a major field.

No student transferring from another college or university is eligible to receive a degree until at least 46 quarter hours of academic work have been completed at Northeastern University immediately preceding graduation.

Associate in Science Degree Program

The program leading to the associate degree is offered for those who wish to obtain a general background in correctional practices, law enforcement, or security, but do not wish to pursue a major field of concentration for the baccalaureate degree.

Candidates for the Associate in Science degree must complete a minimum of 96 quarter hours of credit. This is approximately one half of the requirements for the Bachelor of Science degree, and includes at least 40 quarter hours of work in a major field.

Honors Program

*The Honors Program in the field of law enforcement is designed to provide qualified students with the opportunity to achieve a broader and deeper intellectual academic experience within their chosen fields: corrections, law enforcement, or security.

In general, the Honors Program consists of the following areas: independent study, directed reading seminar, independent research projects, and special seminars.

The particular academic structure of a student's Honors Program will be arranged in consultation with the Program Director and the Honors Faculty Committee, to direct the student's program.

The Honors Program is open to all matriculated Law Enforcement Program students in University College, who have obtained an associate degree or equivalent, and a minimum cumulative grade point average of 3.0. Students who are eligible for this program may apply for admission and approval, to the Director of Law Enforcement Programs.

Advanced Standing Credit—Credit for Non-Collegiate Experience (NCE)

A matriculated University College student with a department major in Corrections, Law Enforcement, or Security, may obtain up to 16 quarter hours of credit (excluding CLEP), by petitioning to take a comprehensive examination in the specific subject area based upon the student's knowledge acquired in a non-traditional manner. Petitions for these examinations may be obtained in 102 Churchill Hall or 200 Churchill Hall.

In no case will this credit be considered as partial fulfillment of the residence requirement nor will a letter grade be assigned.

No credit will be assigned in this manner for courses which can be accredited through the CLEP Testing Program at the time of the petition. Credit will only be assigned to specific courses. It is possible that this credit may be applicable toward a degree in University College only.

*For course numbers see page 291.

Course Sequence

The course sequence as listed is merely a frame of reference, a suggested guide to assist students in arranging their program. Students who wish to add a fifth course each quarter to this sequence may do so without approval of the department.

Intensive Courses

Many courses are frequently offered as single quarter intensives during the regular school year. Please refer to the listing of courses on page 301.

Intensive courses offer the opportunity for a student to achieve his objective in a shorter period of time, i.e., a student could reasonably earn a B.S. degree in five years, and an associate degree in three years.

CORRECTIONAL PRACTICES — Bachelor of Science Degree

Basic Courses—required				quarter hours	
**10.327,	10.328,	10.329	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
	*30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Econ. Princ. and Problems I, II, III	6	32
Core Courses—required					
	19.524,	19.525	Social Psychology I, II	4	
19.541,	19.542,	19.543	Abnormal Psychology I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
		21.534	Social Control	2	
		21.547	Social Problems	2	
	21.553,	21.554	Racial and Cultural Relations I, II	4	
		21.557	Urban Sociology	2	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
		22.514	American Constitutional Law	2	
		22.515	Civil Rights	2	
	22.516,	22.517	Public Administration I, II	4	
23.504,	23.505,	23.506	American History I, II, III	6	
	45.511,	45.512	Human Relations in Personnel I, II	4	50

*For new English requirements see explanation on page 220.
**94.601, 602, 603, L. E. Mathematics I, II, III may be taken in place of 10.327, 328, 329.

Major Concentration Courses—required

		94.505	Human Rights in Corrections	2	
		94.506	Basic Statistics in Law Enforcement	2	
		94.507	Correctional Counseling	2	
94.517,	94.518,	94.519	Advanced Correctional Practices I, II, III	6	
		94.523	The Law and Institutional Treatment	2	
		94.524	Comparative Correctional Systems	2	
	94.525,	94.526	Law Enforcement Identification and Records I, II	4	
		94.532	Research Methods in Criminal Justice	2	
		94.544	The American Correctional System	2	
	94.546,	94.547	Social Deviance I, II	4	
	94.549,	94.550	Treatment of Offenders I, II	4	
94.551,	94.552,	94.553	Correctional Administration I, II, III	6	
	94.563,	94.564	Criminology I, II	4	
		94.565	Delinquency Prevention	2	
	94.567,	94.568	Probation and Parole Practices I, II	4	
	94.574,	94.575	Juvenile Corrections I, II	4	
		94.593	Seminar in Correctional Practices	2	
	94.627,	94.628	Administration of Justice I, II	4	
	94.631,	94.632	Criminal Law I, II	4	
	94.633,	94.634	Evidence and Court Procedure I, II	4	**66**
Electives*					**26**
			Total Credits		**174**

*For suggested electives and additional department offerings, see page 128. While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog.

CORRECTIONAL PRACTICES

Recommended Course Sequence for the 7-year Program Leading to the Bachelor of Science Degree

All new students should discuss their program with a program adviser before attempting to undertake the following sequence of courses:

	Quarter 1	Quarter 2	Quarter 3
1st Year	30.601 *Comp. & Rhet. I	30.602 Comp. & Rhet. II	94.505 Human Rts. in Corr.
	94.627 Admin. of Justice I	94.628 Admin. of Justice II	94.544 Amer. Corr. System
	94.631 Criminal Law I	94.632 Criminal Law II	94.523 Law & Inst. Treat.
	94.633 Evid. & Ct. Proc. I	94.634 Evid. & Ct. Proc. II	Elective
2nd Year	19.501 Psychology I	19.502 Psychology II	19.503 Psychology III
	94.546 Soc. Deviance I	94.547 Soc. Deviance II	Elective
	94.567 Prob. & Par. Prac. I	94.568 Prob. & Par. Prac. II	Elective
	94.574 Juvenile Corr. I	94.575 Juvenile Corr. II	94.507 Corr. Counseling
3rd Year	21.501 Sociology I	21.502 Sociology II	21.503 Sociology III
	94.549 Treat. Offenders I	94.550 Treat. Offenders II	94.506 Basic Stats. in L. E.
	19.541 Abnorm. Psych. I	19.542 Abnorm. Psych. II	19.543 Abnorm. Psych. III
	22.514 Amer. Const. Law	22.515 Civil Rights	94.532 Res. Meth. Crim. Just.
4th Year	94.563 Criminology I	94.564 Criminology II	94.565 Del. Prevention
	21.553 Rac. & Cul. Rel. I	21.554 Rac. & Cul. Rel. II	21.557 Urban Sociology
	94.551 Corr. Admin. I	94.552 Corr. Admin. II	94.553 Corr. Admin. III
	23.504 Amer. Hist. I	23.505 Amer. Hist. II	23.506 Amer. Hist. III

*For new English requirements see explanation on page 220.

5th Year	30.604 Intro. to Lit. Forms I	30.605 Intro. to Lit. Forms II	Elective
	94.525 Law Enf. Id. & Rec. I	94.526 Law Enf. Id. & Rec. II	Elective
	22.501 Prin. Polit. Sci. I	22.502 Prin. Polit. Sci. II	22.503 Prin. Polit. Sci. III
	45.511 Hum. Rel. in Pers. I	45.512 Hum. Rel. in Pers. II	Elective
6th Year	94.517 Adv. Corr. Prac. I	94.518 Adv. Corr. Prac. II	94.519 Adv. Corr. Prac. III
	39.501 Ec. Prin. & Prob. I	39.502 Ec. Prin. & Prob. II	39.503 Ec. Prin. & Prob. III
	23.501 Western Civ. I	23.502 Western Civ. II	23.503 Western Civ. III
	19.524 Soc. Psych. I	19.525 Soc. Psych. II	Elective
7th Year	10.327 Mathematics I	10.328 Mathematics II	10.329 Mathematics III
	22.516 Public Admin. I	22.517 Public Admin. II	94.524 Comp. Corr. Systems
	21.534 Social Control	21.547 Social Problems	Elective
	94.593 Sem. Corr. Pract.	Elective	Elective
		Elective	Elective

CORRECTIONAL PRACTICES — Associate in Science Degree

				quarter hours	
Basic Courses—required					
19.501,	19.502,	19.503	Psychology I, II, III	6	
	**30.601,	30.602	Composition and Rhetoric I, II	4	**10**
Core Courses—required					
19.541,	19.542,	19.543	Abnormal Psychology I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
	21.553,	21.554	Racial and Cultural Relations I, II	4	
		21.557	Urban Sociology	2	
		22.514	American Constitutional Law	2	
		22.515	Civil Rights	2	**22**
Major Concentration Courses—required					
		94.505	Human Rights in Corrections	2	
		94.506	Basic Statistics in Law Enforcement	2	
		94.507	Correctional Counseling	2	
		94.523	The Law and Institutional Treatment	2	
		94.532	Research Methods in Criminal Justice	2	
		94.544	The American Correctional System	2	
	94.546,	94.547	Social Deviance I, II	4	
	94.549,	94.550	Treatment of Offenders I, II	4	
94.551,	94.552,	94.553	Correctional Administration I, II, III	6	
	94.563,	94.564	Criminology I, II	4	
		94.565	Delinquency Prevention	2	
	94.567,	94.568	Probation and Parole Practices I, II	4	
	94.574,	94.575	Juvenile Corrections I, II	4	
	94.627,	94.628	Administration of Justice I, II	4	
	94.631,	94.632	Criminal Law I, II	4	
	94.633,	94.634	Evidence and Court Procedure I, II	4	**52**
Electives*					**12**
			Total Credits		**96**

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog. For suggested electives and additional offerings see page 128.

**For new English requirements see explanation on page 220.

CORRECTIONAL PRACTICES

Recommended Course Sequence for the 4-Year Program Leading to the Associate in Science Degree

All new students should discuss their program with an adviser before undertaking the following sequence of courses:

	Quarter I	Quarter 2	Quarter 3
1st Year	30.601 Comp. & Rhet. I	30.602 Comp. & Rhet. II	94.505 Human Rts. in Corr.
	94.627 Admin. of Justice I	94.628 Admin. of Justice II	94.544 Amer. Corr. Sys.
	94.631 Criminal Law I	94.632 Criminal Law II	94.523 Law & Inst. Treat.
	94.633 Evid. & Ct. Proc. I	94.634 Evid. & Ct. Proc. II	Elective
2nd Year	19.501 Psychology I	19.502 Psychology II	19.503 Psychology III
	94.546 Soc. Deviance I	94.547 Soc. Deviance II	Elective
	94.567 Prob. & Par. Prac. I	94.568 Prob. & Par. Prac. II	Elective
	94.574 Juvenile Corr. I	94.575 Juvenile Corr. II	94.507 Corr. Counseling
3rd Year	21.501 Sociology I	21.502 Sociology II	21.503 Sociology III
	94.549 Treat. Offenders I	94.550 Treat. Offenders II	94.506 Basic Stats. in L. E.
	19.541 Abnorm. Psych. I	19.542 Abnorm. Psych. II	19.543 Abnorm. Psych. III
	22.514 Amer. Const. Law	22.515 Civil Rights	94.532 Res. Meth. Crim. Just.
4th Year	94.563 Criminology I	94.564 Criminology II	94.565 Del. Prevention
	21.553 Rac. & Cul. Rel. I	21.554 Rac. & Cul. Rel. II	21.557 Urban Sociology
	94.551 Corr. Admin. I	94.552 Corr. Admin. II	94.553 Corr. Admin. III
	Elective	Elective	Elective

LAW ENFORCEMENT — Bachelor of Science Degree

Basic Courses—required				quarter hours	
**10.327,	10.328,	10.329	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
	*30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	**32**
Core Courses—required					
	19.524,	19.525	Social Psychology I, II	4	
19.541,	19.542,	19.543	Abnormal Psychology I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
		21.534	Social Control	2	
		21.547	Social Problems	2	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
		22.514	American Constitutional Law	2	
		22.515	Civil Rights	2	
	22.516,	22.517	Public Administration I, II	4	
23.504,	23.505,	23.506	American History I, II, III	6	
29.501,	29.502,	29.503	Effective Speaking I, II, III	6	**46**

*For new English requirements see explanation on page 220.
**94.601, 602, 603, L. E. Mathematics I, II, III, may be taken in place of 10.327, 10.328, 10.329.

Major Concentration Courses—required			quarter hours	
	94.506	Basic Statistics in Law Enforcement	2	
94.508,	94.509	Criminal Investigation and Case Preparation I, II	4	
	94.512	Comparative Police Systems	2	
94.514,	94.515	Interviews and Interrogations I, II	4	
94.520,	94.521	Traffic Safety & Control I, II	4	
94.525,	94.526	Law Enforcement Identification and Records I, II	4	
	94.530	Police Public Relations	2	
	94.531	Police Community Relations	2	
	94.532	Research Methods in Criminal Justice	2	
94.536,	94.537	The Patrol Function I, II	4	
94.541,	94.542	Introduction to Criminalistics I, II	4	
94.546,	94.547	Social Deviance I, II	4	
	94.557	Investigative Report Writing	2	
	94.560	Police Supervision	2	
	94.561	Police Work with Juveniles	2	
94.563,	94.564	Criminology I, II	4	
	94.565	Delinquency Prevention	2	
94.571,	94.572	Law Enforcement Management and Planning I, II	4	
94.621,	94.622	Civil Liberties and the Police I, II	4	
94.627,	94.628	Administration of Justice I, II	4	
94.629,	94.630	Civil Law in Criminal Justice I, II	4	
94.631,	94.632	Criminal Law I, II	4	
94.633,	94.634	Evidence and Court Procedure I, II	4	**74**
Electives*				**22**
		Total Credits		**174**

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog. For suggested electives and additional department offerings, see page 128.

LAW ENFORCEMENT

Recommended Course Sequence for the 7-Year Program Leading to the Bachelor of Science Degree

All new students should discuss their program with an adviser before undertaking the following sequence of courses:

	Quarter 1	Quarter 2	Quarter 3
1st Year	30.601 Comp. & Rhet. I	30.602 Comp. & Rhet. II	Elective
	94.627 Admin. of Justice I	94.628 Admin. of Justice II	94.530 Polic Public Rel.
	94.631 Criminal Law I	94.632 Criminal Law II	22.514 Const. Law
	94.633 Evid. & Ct. Proc. I	94.634 Evid. & Ct. Proc. II	22.515 Civil Rights
2nd Year	21.501 Sociology I	21.502 Sociology II	21.503 Sociology III
	94.536 Patrol Funct. I	94.537 Patrol Funct. II	94.560 Police Supervision
	94.541 Int. Criminalist. I	94.542 Int. Criminalist. II	Elective
	94.514 Interv. & Interr. I	94.515 Interv. & Interr. II	Elective
3rd Year	19.501 Psychology I	19.502 Psychology II	19.503 Psychology III
	94.546 Social Deviance I	94.547 Social Deviance II	21.547 Social Problems
	94.508 Cr. Inv. Case Prep. I	94.509 Cr. Inv. Case Prep. II	94.557 Inv. Report Writing
	94.629 Civ. Law Crim. Just. I	94.630 Civ. Law Crim. Just. II	94.532 Res. Meth. Crim. Just.
4th Year	94.563 Criminology I	94.564 Criminology II	94.565 Del. Prevention
	19.541 Abnorm. Psych. I	19.542 Abnorm. Psych. II	19.543 Abnorm. Psych. III
	94.520 Traf. Sfty. & Cont. I	94.521 Traf. Sfty. & Cont. II	94.512 Comp. Pol. Systems
	94.621 Civ. Lib. & Police I	94.622 Civ. Lib. & Police II	94.561 Pol. Work w/Juv.

5th Year	29.501 Effec. Spkg. I	29.502 Effec. Spkg. II	29.503 Effec. Spkg. III
	23.504 Amer. History I	23.505 Amer. History II	23.506 Amer. History III
	94.571 Law Enf. Mgt. & Pl. I	94.572 Law Enf. Mgt. & Pl. II	94.506 Basic Stat. in Law Enf.
	30.604 Intro. to Lit. Forms I	30.605 Intro. to Lit. Forms II	94.531 Police Comm. Rel.
6th Year	10.327 Mathematics I	10.328 Mathematics II	10.329 Mathematics III
	22.501 Prin. Polit. Sci. I	22.502 Prin. Polit. Sci. II	22.503 Prin. Polit. Sci. III
	94.525 Law Enf. Id. & Rec. I	94.526 Law Enf. Id. & Rec. II	Elective
	19.524 Soc. Psych. I	19.525 Soc. Psych. II	21.534 Social Control
7th Year	39.501 Ec. Prin. & Prob. I	39.502 Ec. Prin. & Prob. II	39.503 Ec. Prin. & Prob. III
	23.501 Western Civ. I	23.502 Western Civ. II	23.503 Western Civ. III
	Elective	Elective	Elective
	22.516 Public Admin. I	22.517 Public Admin. II	Elective

LAW ENFORCEMENT — Associate in Science Degree

				quarter hours	
Basic Courses—required					
19.501,	19.502,	19.503	Psychology I, II, III	6	
	**30.601,	30.602	Composition and Rhetoric I, II	4	**10**
Core Courses—required					
19.541,	19.542,	19.543	Abnormal Psychology I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
		22.514	American Constitutional Law	2	
		22.515	Civil Rights	2	**16**
Major Concentration Courses—required					
	94.508,	94.509	Criminal Investigation and Case Preparation I, II	4	
	94.514,	94.515	Interviews and Interrogations I, II	4	
	94.520,	94.521	Traffic Safety & Control I, II	4	
		94.530	Police Public Relations	2	
		94.531	Police Community Relations	2	
		94.532	Research Methods in Criminal Justice	2	
	94.536,	94.537	The Patrol Function I, II	4	
	94.541,	94.542	Introduction to Criminalistics I, II	4	
	94.546,	94.547	Social Deviance I, II	4	
		94.557	Investigative Report Writing	2	
		94.560	Police Supervision	2	
		94.561	Police Work with Juveniles	2	
	94.563,	94.564	Criminology I, II	4	
		94.565	Delinquency Prevention	2	
	94.627,	94.628	Administration of Justice I, II	4	
	94.629,	94.630	Civil Law in Criminal Justice I, II	4	
	94.631,	94.632	Criminal Law I, II	4	
	94.633,	94.634	Evidence and Court Procedure I, II	4	**58**
Electives*					**12**
			Total Credits		**96**

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog. For suggested electives and additional department offerings, see page 128.
**For new English requirements see explanation on page 220.

LAW ENFORCEMENT

Recommended Course Sequence for the 4-Year Program Leading to the Associate in Science Degree

All new students should discuss their program with their program adviser before undertaking the following sequence of courses.

	Quarter I	Quarter 2	Quarter 3
1st Year	30.601 Comp. & Rhet. I	30.602 Comp. & Rhet. II	Elective
	94.627 Admin. of Justice I	94.628 Admin. of Justice II	94.530 Police Public Rel.
	94.631 Criminal Law I	94.632 Criminal Law II	22.514 Const. Law
	94.633 Evid. & Ct. Proc. I	94.634 Evid. & Ct. Proc. II	22.515 Civil Rights
2nd Year	21.501 Sociology I	21.502 Sociology II	21.503 Sociology III
	94.536 Patrol Funct. I	94.537 Patrol Funct. II	94.560 Police Supervision
	94.541 Int. Criminalist. I	94.542 Int. Criminalist. II	Elective
	94.514 Interv. & Interr. I	94.515 Interv. & Interr. II	Elective
3rd Year	19.501 Psychology I	19.502 Psychology II	19.503 Psychology III
	94.546 Social Deviance I	94.547 Social Deviance II	94.561 Pol. Work w/Juv.
	94.508 Cr. Inv. & Case Prep. I	94.509 Cr. Inv. & Case Prep. II	94.557 Inv. Report Writing
	94.629 Civ. Law Crim. Just. I	94.630 Civ. Law Crim. Just. II	94.532 Res. Meth. Crim. Just.
4th Year	94.563 Criminology I	94.564 Criminology II	94.565 Del. Prevention
	19.541 Abnorm. Psych. I	19.542 Abnorm. Psych. II	19.543 Abnorm. Psych. III
	94.520 Traf. Sfty. & Cont. I	94.521 Traf. Sfty. & Cont. II	94.531 Police Comm. Rel.
	Elective	Elective	Elective

SECURITY — Bachelor of Science Degree

Basic Courses—required				quarter hours	
**10.327,	10.328,	10.329	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
	*30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	**32**
				—	

Core Courses—required					
19.532,	19.533,	19.534	Industrial Psychology I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
		22.514	American Constitutional Law	2	
		22.515	Civil Rights	2	
	22.516,	22.517	Public Administration I, II	4	
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
44.501,	44.502,	44.503	Principles of Finance, Principles of Investments, Principles of Insurance and Risk Management	6	
44.514,	44.515,	44.516	Property and Casualty Insurance I, II, III	6	
	45.610,	45.611	Labor Management Relations	4	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	
		45.620	Industrial Safety	2	**50**
				—	

*For new English requirements see explanation on page 220.
**94.601, 94.602, 94.603, L. E. Math I, II, III, may be taken in place of 10.327, 10.328, 10.329.

Major Concentration Courses—required

94.508,	94.509	Criminal Investigation and Case Preparation I, II	4	
	94.513	Introduction to Industrial Security	2	
94.514,	94.515	Interviews and Interrogations I, II	4	
	94.516	Security Administration	2	
94.525,	94.526	Law Enforcement Identification and Records I, II	4	
94.536,	94.537	The Patrol Function I, II	4	
94.541,	94.542	Introduction to Criminalistics I, II	4	
	94.557	Investigative Report Writing	2	
94.563,	94.564	Criminology I, II	4	
	94.565	Delinquency Prevention	2	
94.571,	94.572	Law Enforcement Management and Planning I, II	4	
94.577, 94.578,	94.579	Government Security Programs I, II, III	6	
	94.582	Document Control	2	
	94.583	Industrial Fire Prevention	2	
94.584,	94.585	Physical Security I, II	4	
	94.586	Retail Security	2	
	94.587	Bank Security Measures	2	
	94.591	Seminar in Security	2	
94.627,	94.628	Administration of Justice I, II	4	
94.629,	94.630	Civil Law in Criminal Justice I, II	4	
94.631,	94.632	Criminal Law I, II	4	
94.633,	94.634	Evidence and Court Procedure I, II	4	**72**
Electives*				**20**
				174

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog. For suggested electives and additional department offerings, see page 128.

SECURITY

Recommended Course Sequence for the 7-year Program Leading to the Bachelor of Science Degree

All new students should discuss their program with their program adviser before undertaking the following sequence of courses:

	Quarter I	Quarter 2	Quarter 3
1st Year	30.601 Comp. & Rhet. I	30.602 Comp. & Rhet. III	94.513 Introd. Indust. Sec.
	94.627 Admin. of Justice I	94.628 Admin. of Justice II	94.586 Retail Security
	94.631 Criminal Law I	94.632 Criminal Law II	Elective
	94.633 Evid. & Ct. Proc. I	94.634 Evid. & Ct. Proc. II	Elective
2nd Year	94.514 Interv. & Interr. I	94.515 Interv. & Interr. II	Elective
	19.501 Psychology I	19.502 Psychology II	19.503 Psychology III
	94.536 Patrol Funct. I	94.537 Patrol Funct. II	94.583 Indust. Fire Prev.
	94.584 Phys. Security I	94.585 Phys. Security II	94.516 Security Admin.
3rd Year	21.501 Sociology I	21.502 Sociology II	21.503 Sociology III
	94.508 Cr. Inv. & Case Prep. I	94.509 Cr. Inv. & Case Prep. II	94.557 Invest. Report Writing
	19.532 Int. Indust. Psy. I	19.533 Int. Indust. Psy. II	19.534 Int. Indust. Psy. III
	94.629 Civ. Law in Crim. Just. I	94.630 Civ. Law in Crim. Just. II	Elective
4th Year	94.563 Criminology I	94.564 Criminology II	94.565 Del. Prevention
	45.570 Elec. Data Proc. I	45.571 Elec. Data Proc. II	45.572 Elec. Data Proc. III
	94.577 Gov. Sec. Prog. I	94.578 Gov. Sec. Prog. II	94.579 Gov. Sec. Prog. III
	22.514 Amer. Const. Law	22.515 Civil Rights	Elective

5th Year	30.604 Intro. to Lit. Forms I	30.605 Intro. to Lit. Forms II	
	23.501 Western Civ. I	23.502 Western Civ. II	23.503 Western Civ. III
	94.541 Int. Criminalist. I	94.542 Int. Criminalist. II	94.582 Document Control
	94.571 Law Enf. Mgt. & Plan. I	94.572 Law Enf. Mgt. & Plan. II	Elective
6th Year	39.501 Ec. Prin. & Prob. I	39.502 Ec. Prin. & Prob. II	39.503 Ec. Prin. & Prob. III
	41.501 Acctg. Prin. I	41.502 Acctg. Prin. II	41.503 Acctg. Prin. III
	45.610 Labor Mgt. Rel. I	45.611 Labor Mgt. Rel. II	
	94.525 Law. Enf. Id. & Rec. I	94.526 Law Enf. Id. & Rec. II	Elective
	44.501 Prin. of Finance	44.502 Prin. of Invest.	44.503 Prin. of Ins. & Risk Mgmt.
7th Year	10.327 Mathematics I	10.328 Mathematics II	10.329 Mathematics III
	44.514 Prop. & Cas. Ins. I	44.515 Prop. & Cas. Ins. II	44.516 Prop. & Cas. Ins. III
	94.587 Bank Sec. Meas.	45.620 Indust. Safety I	94.591 Sem. In Security
	22.516 Public Admin. I	22.517 Public Admin. II	Elective

SECURITY — Associate in Science Degree

				quarter hours	
Basic Courses—required					
19.501,	19.502,	19.503	Psychology I, II, III	6	
	**30.601,	30.602	Composition and Rhetoric I, II	4	**10**
Core Courses—required					
19.532,	19.533,	19.534	Industrial Psychology I, II, III	6	
21.501,	21.502,	21.503	Sociology I, II, III	6	
		22.514	American Constitutional Law	2	
		22.515	Civil Rights	2	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	**22**
Major Concentration Courses—required					
	94.508,	94.509	Criminal Investigation and Case Preparation I, II	4	
		94.513	Introduction to Industrial Security	2	
	94.514,	94.515	Interviews and Interrogations I, II	4	
		94.516	Security Administration	2	
	94.536,	94.537	The Patrol Function I, II	4	
		94.557	Investigative Report Writing	2	
	94.563,	94.564	Criminology I, II	4	
		94.565	Delinquency Prevention	2	
94.577,	94.578,	94.579	Government Security Programs I, II, III	6	
		94.583	Industrial Fire Prevention	2	
	94.584,	94.585	Physical Security I, II	4	
		94.586	Retail Security	2	
	94.627,	94.628	Administration of Justice I, II	4	
	94.629,	94.630	Civil Law in Criminal Justice I, II	4	
	94.631,	94.632	Criminal Law I, II	4	
	94.633,	94.634	Evidence and Court Procedure I, II	4	**54**
Electives*					**10**
			Total Credits		**96**

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog. For suggested electives and additional department offerings, see page 128.

**For new English requirements see explanation on page 220.

SECURITY

Recommended Course Sequence for the 4-Year Program Leading to the Associate in Science Degree

All new students should discuss their programs with an adviser before undertaking the following sequence of courses:

	Quarter I	Quarter 2	Quarter 3
1st Year	30.601 Comp. & Rhet. I	30.602 Comp. & Rhet. II	94.513 Intro. Indust. Sec.
	94.627 Admin. of Justice I	94.628 Admin. of Justice II	94.586 Retail Security
	94.631 Criminal Law I	94.632 Criminal Law II	Elective
	94.633 Evid. & Ct. Proc. I	94.634 Evid. & Ct. Proc. II	Elective
2nd Year	94.514 Interv. & Interr. I	94.515 Interv. & Interr. II	Elective
	19.501 Psychology I	19.502 Psychology II	19.503 Psychology III
	94.536 Patrol Funct. I	94.537 Patrol Funct. II	94.583 Indust. Fire Prev.
	94.584 Phys. Security I	94.585 Phys. Security II	94.516 Security Admin.
3rd Year	21.501 Sociology I	21.502 Sociology II	21.503 Sociology III
	94.508 Cr. Inv. & Case Prep. I	94.509 Cr. Inv. & Case Prep. II	94.557 Invest. Report Writing
	19.532 Int. Indust. Psy. I	19.533 Int. Indust. Psy. II	19.534 Int. Indust. Psy. III
	94.629 Civ. Law in Crim. Just. I	94.630 Civ. Law in Crim. Just. II	Elective
4th Year	94.563 Criminology I	94.564 Criminology II	94.565 Del. Prevention
	45.570 Elect. Data Proc. I	45.571 Elect. Data Proc. II	45.572 Elect. Data Proc. III
	94.577 Gov. Sec. Prog. I	94.578 Gov. Sec. Prog. II	94.579 Gov. Sec. Prog. III
	22.514 Amer. Const. Law	22.515 Civil Rights	Elective

SUGGESTED ELECTIVES AND ADDITIONAL DEPARTMENT OFFERINGS

Suggested Electives*

94.595	The National Law Enforcement Seminar	3
94.596	Hospital Security	2
94.614	Seminar in Law Enforcement: Interviewing Practicum	2
94.619	Seminar in Law Enforcement: Forensic Laboratory	2
94.617	Seminar in Law Enforcement: Criminal Behavior	2
94.624	Seminar in Law Enforcement: Executive Development	2
94.626	Seminar in Law Enforcement: Data Processing	2
32.609	Conversational Spanish I	4
32.610	Conversational Spanish II	4
32.611	Conversational Spanish III	4

Additional Department Offerings

94.604	Seminar in Law Enforcement: Youth Crime Control	2
94.605	Seminar in Law Enforcement: Victimology	2
94.606	Seminar in Law Enforcement: International Crime Control	2
94.607	Seminar in Law Enforcement: Grantmanship	2
94.608	Seminar in Law Enforcement: Law Enforcement Operational Intelligence	2
94.609	Independent Studies	2
94.610	Seminar in Law Enforcement: Collective Bargaining	2
94.611	Man, Law, and Society I	2
94.612	Man, Law, and Society II	2
94.613	Man, Law, and Society III	2
94.615	Seminar in Law Enforcement: Organized Crime	2
94.616	Seminar in Law Enforcement: Minorities and the Urban Crisis	2
94.618	Seminar in Law Enforcement: Prosecutive Development	2
94.620	Seminar in Law Enforcement: Intervention, Strategies, and Tactics for Law Enforcement (Counseling Techniques)	2
94.623	Seminar in Law Enforcement: Drugs	2
94.625	Seminar in Law Enforcement: Mental Health and the Police	2
94.650	Fire Investigation and Arson I	2
94.651	Fire Investigation and Arson II	2
94.658	Alcohol Problems in Law Enforcement	2
94.652	Law Enforcement Fiscal Management	2
94.653	Massachusetts Criminal Law	2

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College catalog.

health professions programs

Helene A. Loux, Associate Dean
Director, Health Professions Programs
Telephone 437-3321

Aims

Programs in Health Sciences are offered through University College in order to help mature students improve their educational preparation for advancement and service in hospitals and other health agencies through part-time study.

In addition to offering courses in the liberal arts and in business administration, specialized courses for particular categories of health personnel are offered when such offerings are justified in terms of community and student need. The unique resources of the Boston area as a medical center offer excellent support facilities for these health-related programs.

Degree programs, both associate and baccalaureate, are designed to provide professional specialization and general cultural development. All programs are designed to meet the accreditation standards of the Council on Medical Education of the American Medical Association and of licensing or registration boards where such exist.

Course Distribution

While students will graduate from the programs in health science prepared to assume a position in the health profession of his choice, and in which he has specialized, it is the goal of Northeastern University that graduates will have a balanced educative background. To this end, the following curriculum design will be in effect for most programs.

Professional and Professionally Related	35–50%
Basic and Allied Sciences	25–40%
Liberal Arts (non-science)	25–40%

Students will choose electives to fulfill course distribution requirements and to equal the number of credits required for the specific degree.

Clinical Assignments

Clinical assignments are available for students whose program requires directed applied study in a clinical setting. In most instances didactic information is presented at the University while clinical practice is at various hospitals or other health agencies in the Greater Bos-

ton community. Academic credit earned during the practicum is applicable in most instances, toward the degree requirement.

Students accepting clinical assignments in hospitals, either as part of their clinical rotations or cooperative assignments, are expected to adhere to hospital dress codes and any other requirements of the hospital, all of which are outside University control.

HEALTH SCIENCE — Bachelor of Science in Health Science Degree

The Bachelor of Science in Health Science is available to students holding an Associate Degree and/or certification, registration, or licensure (as defined by University regulations) in a specific health profession.

REQUIREMENTS FOR THE DEGREE

DISTRIBUTION REQUIREMENTS		quarter hours
A. Liberal Arts (non-science)	25–40%	44–70
B. Basic and Allied Science	25–40%	44–70
C. Professional and Professionally-related	35–50%	62–86
D. Electives—to equal	100%	**174**

A. LIBERAL ARTS

(Non-science)

Required

English		8
30.601, 30.602 or 30.603	Composition and Rhetoric I, II, (or intensive) or equivalent	
30.604, 30.605 or 30.606	Introduction to Literary Forms I & II (or intensive) or equivalent	
Humanities (Recommended Courses)		12
	Introduction to Philosophy Spanish or Other Modern Language Communications or Speech Literature Arts	
Social Sciences (Recommended Courses)		12
	Psychology History Sociology Principles of Political Science	
Electives	to equal at least 12 quarter hours	12
		44

B. BASIC AND ALLIED SCIENCES

Required		quarter hours
General	General and Animal Biology	8
	Anatomy and Physiology	9
	Microbiology	4
	Math or Applied Math (as profession demands)	6
	General Chemistry (if profession demands)	9
Advanced		8
To be taken after matriculation into B.S. program and to be determined by profession.		
		44

C. PROFESSIONAL AND PROFESSIONALLY RELATED

Required		quarter hours
General		14
86.504, 86.505, 86.506 or 86.512, 86.513	Foundations of Medical Science I, II, III	6
86.541, 86.542	Medical Care and Current Social Problems	4
86.521, 86.522	Public Health	4
87.544, 87.545 or equivalent	Epidemiology	4
Basic Professional Courses		(variable)

Those required for professional certification, registration, or licensure as defined by University regulations.

Advanced Professional or Professionally-related Courses	18–24
To be taken after matriculation into B.S. program:	
Specific profession or in general health area (As determined by program director or academic counselor)	6–8
Health Science Education (Or related education courses)	6–8
Health Science Administration (Or related administrative courses)	6–8

D. ELECTIVES

To equal 174 q.h. credits and to fulfill distribution requirements.

All students admitted to this program will be interviewed by Program Director and/or Admissions Committee. Specific applications are available.

MANAGEMENT IN HEALTH AGENCIES AND INSTITUTIONS

Bachelor of Science Degree

				quarter hours	
Basic Courses—required					
10.327,	10.328,	10.329	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
	30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	32
Core Courses—required					
Liberal Arts					
18.511,	18.512,	18.513	Biology I, II, III	12*	
		19.532	Industrial Psychology	2	
21.501,	21.502,	21.503	Sociology I, II, III	6	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
Literature:			English, American, or other in translation	6	
Fine Arts:			Art, Music, or Theater Arts	6	44
Management					
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
44.507,	44.508,	44.509	Corporate Finance I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
	45.511,	45.512	Human Relations in Personnel I, II	4	
45.513,	45.514,	45.515	Personnel Management I, II, III	6	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	34
Health Care Administration					
		86.502	Hospital Law and Ethics	2	
86.504,	86.505,	86.506	Foundations of Medical Science I, II, III	6	
		86.507	Medical Terminology	2	
In addition, each student will select *one* of the following sequences:					
86.581,	86.582,	86.583	Hospital Organization and Management I, II, III—OR		
86.571,	86.572,	86.573	Long-Term Care Administration I, II, III—OR	6	
	86.521,	86.522	Public Health I, II (4) *and*	—	
		86.511	Personal and Community Health (2)		16
Elective Courses:					
			Liberal Arts	6	
			Management	6	
			From Any Area 36	48	
			Total Credits		174

Note: *In addition to the required coursework, proof of understanding of principles of descriptive statistics must be demonstrated. This requirement may be satisfied by: a) successful completion of the examination on descriptive statistics administered by Northeastern's Center for Programmed Study;* **or** *b) completion of the program on descriptive statistics at the Center;* **or** *c) completion of the University College course 39.511, Statistics I, with a grade of C or better. This last option may also be included in the elective credits required in this curriculum. This requirement should be satisfied before completion of the first 96 credits of coursework.*

A significant number of elective courses is allowed, to permit each student to select, with his adviser, a sequence of courses which will represent examination in some depth of a subject of particular interest. Ordinarily, these courses would not be distributed over more than two subject areas.

MANAGEMENT IN HEALTH AGENCIES AND INSTITUTIONS

Recommended Course Sequence for the 8-Year Program Leading to the Bachelor of Science Degree

	Quarter 1	Quarter 2	Quarter 3
1st Year	Medical Terminology I	Comp. I	Comp. II
	Mgmt. & Org. I	Mgmt. & Org. II	Mgmt. & Org. III
	Math. I	Math. II	Math. II
2nd Year	Western Civ. I	Western Civ. II	Western Civ. III
	Acctg. I	Acctg. II	Acctg. III
	Biology I	Biology II	Biology III
3rd Year	Psych. I	Psych. II	Psych. III
	Elective	Elective	Elective
	Intro. to Lit. Forms I	Intro. to Lit. Forms II	Hospital Law
4th Year	Ind. Psych.	Human Rel. I	Human Rel. II
	Pers. Mgmt. I	Pers. Mgmt. II	Pers. Mgmt. III
	Found. Med. Sci. I	Found. Med. Sci. II	Found. Med. Sci. III
5th Year	Econ. I	Econ. II	Econ. III
	Fine Arts	Fine Arts	Fine Arts
	Mgmt. Elective	Mgmt. Elective	Mgmt. Elective
	Literature	Literature	Literature
6th Year	Soc. I	Soc. II	Soc. III
	E.D.P. I	E.D.P. II	E.D.P. III
	L. A. Elective	L.A. Elective	L.A. Elective
	Corp. Fin. I	Corp. Fin. II	Corp. Fin. III
7th Year	Pol. Sci. I	Pol. Sci. II	Pol. Sci. III
	Hospital Org., Long-Term C. I, or Pub. Health I	Hospital Org., Long-Term C. II, or Pub. Health II	Hospital Org., Long-Term C. III, or Per. Comm. Health
	Elective	Elective	Elective
	Elective	Elective	Elective
	Elective	Elective	Elective
8th Year	Phil. I	Phil. II	Phil. III
	Elective	Elective	Elective
	Elective	Elective	Elective

NURSING HOME ADMINISTRATION CERTIFICATE PROGRAM

Under the Social Security Law—Title XIX, programs for the licensure of nursing home administrators must be available in each state. In order to provide the educational preparation required by Title XIX and to meet the immediate needs of long-term care and nursing home administrators, while still providing academically structured courses that will apply to a degree program, the following sequence is offered:

19.501,	19.502,	19.503	Psychology I, II, III	6
		19.532	Industrial Psychology	2
41.501,	41.502,	41.503	Accounting Principles I, II, III	6
		45.501	Management and Organization I	2
	45.511,	45.512	Human Relations in Personnel I, II	4
		86.502	Hospital Law and Ethics	2
86.504,	86.505,	86.506	Foundations of Medical Science I, II, III	6
	86.507,	86.508	Medical Terminology I, II	4
86.571,	86.572,	86.573	Long-Term Care Administration I, II, III	6
86.577,	86.578,	86.579	Long-Term Care Administration IV, V, VI	6
			Total Credits	**44**

Successful completion of this course of study with a quality point average of 2.00 will entitle the student to a letter attesting to this accomplishment and will prepare the student to write the present licensure examination in Massachusetts. The Board of Registration in Nursing Home Administration in Massachusetts will require two years of college level study (four years, part-time) by 1975 and a baccalaureate degree by 1978.

Completion of the above described sequence of courses and possession of the letter documenting this fact does not constitute graduation from University College.

Program Consultant:
Robert Lovejoy, M.S.
Executive President, Waltham Hospital
Lecturer in Health Science, Northeastern University

Course Consultant in Nursing Home Administration Program:
Jack Chilnick, M.Ed.
Executive Director, Jewish Rehabilitation Center for the Aged of the North Shore
Lecturer in Health Science, Northeastern University

MEDICAL RECORD ADMINISTRATION

The Profession

The medical record administrator has varied responsibilities relating to health information systems. He designs systems; he plans, organizes, and directs medical record services; he develops, analyzes, and evaluates medical records and indexes; he cooperates with the medical staff in developing methods for evaluation of patient care; he cooperates with the medical and administrative staff in research projects utilizing health care information; and provides advisory services relating to health information systems on local, national, and international level.

The Medical Record Administration Program leading to a baccalaureate degree has been in effect at Northeastern University since 1966. The professional certification program, open to students already holding baccalaureate degrees and offering the required professional courses, was instituted in 1967.

Northeastern University's Programs in Medical Record Administration are approved by the American Medical Association's Council on Medical Education, in collaboration with the Committee on Education and Registration of the American Medical Record Association.

Note: *This program is also offered on a full-time (day) basis.*

The information following refers only to the part-time (evening) program. Further information about this Program and/or information about the Day Program may be obtained by contacting the Allied Health Professions Office, 201 Robinson Hall.

MEDICAL RECORD ADMINISTRATION Bachelor of Science Degree

Completion of this program qualifies a student for admission to the professional registration examinations conducted by the American Medical Record Association.

Basic Courses—required				quarter hours	
10.327,	10.328,	10.329	Mathematics I, II, III	6	
19.501,	19.502,	19.503	Psychology I, II, III	6	
23.501,	23.502,	23.503	Western Civilization I, II, III	6	
	30.601,	30.602	Composition and Rhetoric I, II	4	
	30.604,	30.605	Introduction to Literary Forms I, II	4	
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	32
Core Courses—required					
Liberal Arts:					
18.511,	18.512,	18.513	General Biology and Laboratory I, II, III	12	
18.524,	18.525,	18.526	Anatomy and Physiology I, II, III	9	
		19.532	Industrial Psychology	2	
21.501,	21.502,	21.503	Sociology I, II, III	6	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
Literature:			English, American or other in translation	6	
Fine Arts:			Art, Music, or Theatre Arts	6	53
Professional and Professionally-related Courses—required					
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
	45.511,	45.512	Human Relations in Organizations	4	
	45.570,	45.571	Electronic Data Processing I, II	4	
		86.585	Medical Computer Science	2	16
		86.502	Hospital Law and Ethics	2	
86.504,	86.505,	86.506	Foundations of Medical Science I, II, III	6	
	86.507,	86.508	Medical Terminology I, II	4	12
86.551,	86.552,	86.553	Organization of the Medical Records Department I, II, III	6	
86.554,	86.555,	86.556	Medical Record Science I, II, III	12	
	85.557,	86.558	Medical Record Science IV, V	8	
86.586,	86.587,	86.588	Applied Medical Record Science I, II, III	8	34
Elective Courses					
			Liberal Arts	6	
			From Any Area	22	28
			Total Credits		175

Candidates who wish to major in this program must be interviewed by the Program Director. Arrangements for this interview may be made through the Allied Health Professions Office, 201 Robinson Hall. No candidate will be considered as matriculated until this requirement has been met.

Note: *In addition to the required coursework, proof of understanding of principles of descriptive statistics must be demonstrated. This requirement may be satisfied by: a) successful completion of the examination on descriptive statistics administered by Northeastern's Center for Programmed Study;* **or** *b) completion of the program on descriptive statistics at the Center;* **or** *c) completion of the University College course 39.511; Statistics I, with a grade of C or better. This last option may also be included in the elective credits required in this curriculum. This requirement should be satisfied before completion of the first 96 credits of coursework.*

Recommended Course Sequence for the 8-Year Program Leading to the Bachelor of Science Degree in Medical Records and qualification for examination.

	Quarter 1	Quarter 2	Quarter 3
1st Year	Comp. and Rhet. I Mgmt. & Org. I Math. I	Comp. and Rhet. II Mgmt. & Org. II Math. II	Elective Mgmt. & Org. III Math. III
2nd Year	West. Civ. I Gen. Biol. & Lab. I Elective	West. Civ. II Gen. Biol. & Lab. II Elective	West. Civ. III Gen. Biol. & Lab. III Elective
3rd Year	Psych. I Anat. & Physiol. I Med. Termin. I Lit. I	Psych. II Anat. & Physiol. II Med. Termin. II Lit. II	Psych. III Anat. & Physiol. III Hospital Law Elective
4th Year	Literature Soc. I Ind. Psych. Found. Med. Sci. I	Literature Soc. II Human Rel. I Found. Med. Sci. II	Literature Soc. III Human Relations II Found. Med. Sci. III
5th Year	Econ. I Fine Arts Med. Rec. Sci. I	Econ. II Fine Arts Med. Rec. Sci. II	Econ. III Fine Arts Med. Rec. Sci. III
6th Year	Med. Rec. Sci. IV* Electives	Med. Rec. Sci. V* Electives	Electives
7th Year	Pol. Sci. I Org. Med. Rec. I L.A. Elective	Pol. Sci. II Org. Med. Rec. II L.A. Elective	Pol. Sci. III Org. Med. Rec. III L. A. Elective Elective
8th Year	Phil. I E.D.P. I Elective Applied Med. Rec. Sci. I	Phil. II E.D.P. II Elective Applied Med. Rec. Sci. II	Phil. III Med. Comp. Sci. Elective Applied Med. Rec. Sci. III

*Required clinical experience hours must be arranged in relation to courses starred.

MEDICAL RECORDS — Certification Program

Candidates who wish to qualify for admission to the professional examination leading to registration as a Medical Record Administrator, RRA, and who already hold a baccalaureate degree in another field of study from a college or university acceptable to Northeastern University, may undertake the following course work. Successful completion of this course sequence with a cumulative point average of 2.00 will lead to certification from University College that the candidate has completed a professional program in Medical Records Science. In addition to the required courses listed below, candidates must complete one year of a natural science, such as Biology, Chemistry, Microbiology, etc. This requirement is in addition to the laboratory course in Anatomy and Physiology.

Courses required for Professional Certification:

				quarter hours
18.524,	18.525,	18.526	Anatomy and Physiology I, II, III	9
45.501,	45.502,	45.503	Management and Organization I, II, III	6
		86.502	Hospital Law and Ethics	2
86.504,	86.505,	86.506	Foundations of Medical Science I, II, III	6
	86.507,	86.508	Medical Terminology I, II	4
86.554,	86.555,	86.556	Medical Record Science I, II, III	12
	86.557,	86.558	Medical Record Science IV, V	8
86.551,	86.552,	86.553	Organization of the Medical Records Department I, II, III	6
	45.570,	45.571	Electronic Data Processing I, II	4
		86.585	Medical Computer Science	2
86.586,	86.587,	86.588	Applied Medical Records Science I, II, III	8
			Total Credits	**67**

Candidates who wish to matriculate in this program must be interviewed by the Program Director. Arrangements for this interview may be through the Allied Health Professions Office, 206 Mugar Building. No candidate will be considered as matriculated until this requirement has been met.

Note: *In addition to the required coursework, proof of understanding of principles of descriptive statistics must be demonstrated. This requirement may be satisfied by: a) successful completion of the examination on descriptive statistics administered by Northeastern's Center for Programmed Study;* **or** *b) completion of the program on descriptive statistics at the Center;* **or** *c) completion of the University College course 39.511, Statistics I, with a grade of C or better. This last option may also be included in the elective credits required in this curriculum. This requirement should be satisfied before completion of the first 96 credits of coursework.*

Note: *This sequence is available through the evening program only.*

MEDICAL RECORD ADMINISTRATION

Recommended Course Sequence for the 3-Year Program Leading to a Certificate in Medical Record Administration

This program is open to candidates who hold an acceptable baccalaureate degree only.

Prerequisite: A College-level course in General Biology

	Quarter 1	Quarter 2	Quarter 3
1st Year	Mgmt. & Org. I	Mgmt. & Org. II	Mgmt. & Org. III
	Anat. & Physiol. I	Anat. & Physiol. II	Anat. & Physiol. III
	Found. Med. Sci. I	Found. Med. Sci. II	Found. Med. Sci. III
	Med. Termin. I	Med. Termin. II	
2nd Year	Med. Rec. Sci. I	Med. Rec. Sci. II	Med. Rec. Sci. III
			Hospital Law
	EDP I	EDP II	Med. Comp. Sci.
3rd Year	*Med. Rec. Sci. IV	*Med. Rec. Sci. V	
	Org. Med. Rec. Dept. I	Org. Med. Rec. Dept. II	Org. Med. Rec. Dept. III
	Applied Med. Rec. Sci. I	Applied Med. Rec. Sci. II	Applied Med. Rec. Sci. III

Hospitals Affiliated as Primary Teaching Units

Beth Israel Hospital, Boston
Children's Hospital Medical Center, Boston
Massachusetts General Hospital, Boston
New England Medical Center
Boston Hospital for Women
Mt. Auburn Hospital, Cambridge

Curriculum Advisory Committee in Medical Record Administration

Sr. Margaret MacDougall, RRA
Holyoke Community College
Janice E. Gardner, RRA
Brookline Hospital
Joyce Gormley, RRA
Massachusetts General Hospital, Boston
Marjorie Gurney, RRA
Massachusetts Hospital Association, Burlington
Dorothy Richmond, RRA
Beth Israel Hospital, Boston
Susan Winship, RRA
Northern Essex Community College, Haverhill
Lillian Liebich, RRA
North Adams Regional Hospital, North Adams

*Required clinical experience hours must be arranged in relation to courses starred.

Northeastern University Representatives
(Ex officio)

Meredith Cameron, RRA
Acting Director, Medical Records Program
Helene A. Loux, Ph.D.
Associate Dean for Health Professions
The College of Pharmacy and Allied Health Professions

RESPIRATORY THERAPY (full-time)

Associate in Science Degree

The Profession

As medical knowledge has advanced and become highly specialized, trained personnel in the fields related to medicine have become important members of the health care team. As members of this team, respiratory therapists support and assist in the effort toward optimum patient care by using a variety of treatments and rehabilitative procedures to help patients with respiratory problems. They work in modern health care facilities with sophisticated respirators, ultrasonic nebulizers, blood gas machines, pulmonary function equipment, and oxygen administering devices.

As physicians rely more and more on specialized techniques and equipment, the respiratory therapist will play an increasingly important role in patient care.

The first year of this program may be completed by study on a part-time basis over two or more years. *An interview with the program faculty is required prior to registration in 86.591, Introduction to Respiratory Therapy I.* The candidate who completes this part-time study with a cumulative average "C" or better may then apply for admission directly into the second year full-time program. Entrance to the full-time program is on a competitive basis. The second and third years of the full-time program are spent in alternating academic and cooperative quarters. Each academic quarter includes twelve hours per week of applied study in Respiratory Therapy as well as didactic study, liberal arts, and electives.

Prerequisite: College-Level or College-Preparatory General Biology

Freshman Year Courses		**quarter hours**
10.327, 10.328, 10.329	Math I, II, III	6
30.603 (or 30.601 and 30.602) and 30.606 (or 30.603 and 30.604)	Composition & Rhetoric Introd. to Lit. Forms	4 4
18.524, 18.525, 18.526	Human Anatomy and Physiology	9
19.501, 19.502	Psychology	4
86.502	Hospital Law & Ethics	2
18.521, 18.522	Microbiology I, II	8
86.591, 86.592, 86.593	Introd. to Respiratory Therapy	12

Suggested Sequence of Courses for Freshman Program

	Quarter I	**Quarter II**	**Quarter III**
1st Year	Math Anatomy & Physiol. Psychology	Math Anatomy & Physiol. Psychology	Math Anatomy & Physiol. Hospital Law & Ethics
2nd Year	Comp. & Rhet. Intro. Resp. Therapy Microbiology	Introd. to Lit. Forms Intro. Resp. Therapy Microbiology	Intro. Resp. Therapy

Students completing these courses must now apply to the full-time program in order to complete the requirements for the Associate in Science Degree and for eligibility to write the national examination for registration as a Respiratory Therapist.

Students accepted into the full-time day program will follow the basic college curriculum in effect at the time of their acceptance.

Medical Advisory Committee

Leonard Bushnell, M.D., Beth Israel Hospital
Dean S. Crocker, M.D., Children's Hospital Medical Center
John Hedley-Whyte, M.D., Beth Israel Hospital
Henning Pontoppidan, M.D., Massachusetts General Hospital
LeRoy Van Dam, M.D., Peter Bent Brigham Hospital

Academic Representatives (Ex Officio)

Dean Crocker, M.D., Medical Consultant
Evelyn L. Cassara, B.S., R.N., A.R.I.T., Program Director
Helene A. Loux, Ph.D., Assoc. Dean for Health Professions, College of Pharmacy and Allied Health Professions

MEDICAL LABORATORY SCIENCE—CYTOTECHNOLOGY

Bachelor of Science Degree or Associate in Science Degree

The Profession

Cytotechnology is a specialty in the broader field of medical laboratory science. Cytotechnologists are employed in pathology laboratories, where they expertly examine slides of cells looking for minute abnormalities which are the early warning signs of cancer and related disease. Cytotechnology occupies a highly important place in clinical medicine, requiring a technologist with highly specialized laboratory training and a sound academic background.

The programs are offered through University College and are conducted in affiliation with the several hospitals which comprise the Boston School of Cytotechnology. The programs lead to the Associate in Science or the Bachelor of Science Degree, which are awarded by University College. Completion of the program qualifies a student for admission to the professional examination conducted by the Board of Registry of the American Society of Clinical Pathologists.

The basic sciences and the general education courses are offered evenings, but the professional courses are offered only full-time, days, in cooperation with the affiliated hospitals. Students planning to enter the professional courses are advised to consult the program coordinator prior to the Winter Quarter preceding entrance to the hospital program.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Basic Mathematics I and II courses (10.330 and 10.331). The Mathematics Placement Test must be taken well in advance of the registration date.

FIRST YEAR

Course Number			Course	quarter hours
10.327,	10.328,	10.329	Mathematics I, II, III	6
			or	
	10.307,	10.308	College Algebra & Trigonometry	
30.603				
or	30.601,	30.602	Composition & Rhetoric I, II	4
18.511,	18.512,	18.513	Biology I, II, III	12
87.100			Medical Laboratory Science Orientation	1
	86.541,	86.542	Medical Care and Current Social Problems	4

SECOND YEAR

Course Number			Course	quarter hours
18.524,	18.525,	18.526	Human Anatomy & Physiology I, II, III	9
12.544,	12.545,	12.546	General Chemistry I, II, III	6
12.547,	12.548,	12.549	General Chemistry Lab. I, II, III	3
19.501,	19.502,	19.503	Psychology	6
			or	
22.501,	22.502,	22.503	Principles of Political Science	
			or	
			Other Social Science Elective	
30.604,	30.605	or		
		30.606	Introd. to Literary Forms	4
		86.502	Hospital Law and Ethics	2

THIRD YEAR

Course Number			Course	quarter hours
87.101			Basic Medical Lab. Science (Fall)	4
87.102	or	87.541	Hematology	2
18.557,	18.558,	18.556	Genetics I, II and Genetics Lab.	6
18.551,	18.552,	18.553	Histology — Organology I, II, III	6
18.521			Microbiology	4
			Humanities Electives	4

FOURTH YEAR

12 months at an AMA-approved Hospital School of Cytotechnology. Those students admitted to the Boston School of Cytotechnology associated with Northeastern University will take the following courses:

		87.508	Introduction to Cytotechnology	2
		87.528	Cytopathology I	2
		87.538	Cytopathology II	2
		87.558	Cytopathology III	2
		87.568	Cytogenetics and New Concepts	2
		87.598	Special Topics	2
		87.608	Seminar: Cytopathology Criteria and Correlations	2
87.518,	87.548,	87.578	Applied Cytology I, II, III, IV	14
		87.618		
				—
			Total A.S. Degree	**111**

FIFTH YEAR

Course Number			Course	quarter hours
86.504,	86.505,	86.506	Foundations of Medical Science	6
11.304,	11.305,	11.306	*General Physics I, II, III	6
			or	
86.581,	86.582,	86.583	Hospital Organization and Management	
			Modern Language	9
			or	
			Electives	

SIXTH YEAR

Course Number			Course	quarter hours
12.531,	12.532,	12.533	Organic Chemistry I, II, III, and	6
12.534,	12.535,	12.536	Organic Chemistry Lab. I, II, III	6
86.574,	86.575,		Health, Disease, and Disability	4
29.501,	29.502,	29.503	Effective Speaking	6
			or	
			Other Speech or Communications Course	

SEVENTH YEAR

Course Number			Course	quarter hours
39.501,	39.502,	39.503	Economics, Principles & Problems	6
			or	
			Other Social Science Elective	
86.521,	86.522		Public Health	4
			or	
87.544,	87.545		Epidemiology	
87.588			Cytopathology Seminar	2
	87.546		Medical Laboratory Science Education Seminar	2
	87.547		Medical Laboratory Science Administration Seminar	2
			Electives	6
			Total B.S. Degree	**176**

*Students planning to enter graduate school should take 4 quarter hours of Analytical Chemistry and 6 quarter hours of Physics.

MEDICAL LABORATORY SCIENCE—MEDICAL TECHNOLOGY

Bachelor of Science Degree or Associate in Science Degree

The Profession

Medical Technology is a respected and important health profession. The medical technologist works as a professional in close association with pathologists, doctors, and hospital and medical laboratory personnel. Working in a variety of specialized fields such as bacteriology, blood-banking, histology, hematology, biochemistry, and nuclear and radiochemistry, the medical technologist makes important observations necessary for critical diagnosis by the doctor upon early detection and treatment of disease.

The Associate Degree Medical Laboratory Technician likewise is an important member of the health team. His responsibilities are commensurate with his background and he works in close association with medical technologists and pathologists.

The Registered Medical Technologist and the Associate Degree Medical Laboratory Technician are in constant demand in hospital laboratories, clinics, public health agencies, pharmaceutical firms, research foundations, and in the Armed Forces.

The baccalaureate program in Medical Technology (Medical Laboratory Science) is conducted in affiliation with several Hospital Schools of Medical Technology approved by the Council on Medical Education of the American Medical Association. The program leads to a Bachelor of Science degree, which is awarded by University College, and entitles the student to write the registry examination in Medical Technology MT (ASCP) given by the Board of Registry of Medical Technologists of the American Society of Clinical Pathologists.

Students who have appropriate clinical experience may apply to write the AD-MLT (ASCP), Associate Degree Medical Laboratory Technician Examination, upon completion of appropriate courses. University College students will be eligible for an Associate degree upon the completion of the courses indicated in the curriculum below and appropriate applied study.

The basic science and general education courses are offered evenings, but the professional courses are offered only full-time, days, in cooperation with the affiliated hospitals. Students planning to enter the professional courses are advised to consult the program coordinator prior to the Winter Quarter preceding entrance to the hospital program.

The Medical Laboratory Science Professional Courses, numbered in the 87.100 and 87.200 series, will be offered directly through the College of Pharmacy and Allied Health Professions. Students must regis-

ter as Special Students of that basic college and tuition will be the same as that charged for all basic college Medical Laboratory Science Professional Courses.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Basic Mathematics I and II courses (10.330 and 10.331). The Mathematics Placement Test must be taken well in advance of the registration date.

FIRST YEAR

Course Number			Course	quarter hours
10.307,	10.308		College Algebra & Trigonometry I, II	8
12.544,	12.545,	12.546	General Chemistry I, II, III	6
12.547,	12.548,	12.549	General Chemistry Lab. I, II, III	3
30.603 or	30.601 &	30.602	Composition and Rhetoric I & II	4
87.100			Medical Laboratory Science Orient.	1
	86.541,	86.542	Medical Care and Current Social Problems	4

SECOND YEAR

Course Number			Course	quarter hours
18.511,	18.512,	12.513	Biology I, II, III	12
12.521,	12.522,	12.523	Analytical Chemistry I, II, III	6
12.524,	12.525,	12.526	Analytical Chemistry Lab. I, II, III	6
30.604,	30.605 or	30.606	Introduction to Literary Forms	4

THIRD YEAR

Course Number			Course	quarter hours
18.524,	18.525,	18.526	Human Anatomy and Physiology	9
19.501,	19.502,	19.503	Psychology I, II, III	6
			or	
22.501,	22.502,	22.503	Principles of Political Science	
			or	
			Other Social Science Elective	
		86.502	Hospital Law and Ethics	2
18.521,	18.522		Microbiology I, II	8

FOURTH YEAR

Course Number		Course	quarter hours
87.101		Basic Medical Laboratory Science	4
87.102,	87.103	Basic Hematology; Basic Blood Banking	4
87.105		Basic Medical Laboratory Chemistry & Instrumentation	4
87.121		Quality Control	2
		Modern Language	9
		or	
		Other Humanities Electives	
		Total A.S. Degree	**102**

Associate degree requirement completed for students who have appropriate applied study, and have completed a minimum of 102 quarter hours of credit including those courses listed above.

FIFTH YEAR

Course Number			Course	quarter hours
39.501,	39.502,	39.503	Economic Principles & Problems I, II, III	6
			or	
			Other Social Science Elective	
12.531,	12.532,	12.533	Organic Chemistry I, II, III	6
12.534,	12.535,	12.536	Organic Chemistry Lab. I, II, III	6
			Electives (non-science)	6

SIXTH YEAR

Course Number			Course	quarter hours
11.304,	11.305,	11.306	General Physics, I, II, III	6
18.557,	18.558,	18.556	Genetics I, II, & Lab.	6
			Elective	3
29.501,	29.502,	29.503	Effective Speaking	6
			or	
			Other Speech or Communications course	

SEVENTH YEAR

12 months internship at an affiliated AMA-Approved Hospital School of Medical Technology.

			or	
	87.202		Hematology-Immunohematology	4
	87.201		Pathogenic Microbiology	4
	87.205		Clinical Chemistry	4
	87.203		Medical Immunology-Serology	2
	87.204		Medical Parasitology	2
87.111,	87.112,	87.115	Applied Studies (at hospital)	12
	87.190		Undergraduate Research	2
	87.221		Medical Laboratory Management	
			or	
	87.226		Health Science Education	2
				—
			Total B.S. Degree	**179**

Please see day school course descriptions for professional courses associated with the A.M.A. Hospital Approved Programs.

MEDICAL LABORATORY SCIENCE—HEMATOLOGY

Bachelor of Science Degree

The Profession

Hematology is a specialty in the broader field of medical laboratory science. Hematology technologists are employed in hospitals and clinical laboratories where they perform specific laboratory tests—including differential cell counts and bone marrow examinations and hemoglobin and hematocrit determinations—which aid in the diagnosis, treatment, and follow-up of infections, anemias, and leukemias. The hematology technologist also performs coagulation studies which aid the diagnosis and treatment of bleeding disorders and the treatment of patients on anticoagulant therapy. The modern hematology laboratory is well equipped with electronic instruments which the technologist must operate and maintain. Additional responsibilities include laboratory quality control and associated problem solving.

The current requirements for categorical certification in hematology are indicated by the Board of Registry of the American Society of Clinical Pathologists as follows:

A candidate for certification in hematology must meet at least one of the following requirements:

1. Certification in Medical Technology by the Board of Registry of the American Society of Clinical Pathologists, plus one year of satisfactory hematology experience in an acceptable laboratory within the three years immediately prior to application.
2. A baccalaureate degree in biological sciences or chemistry from a college or university accredited by a recognized regional accrediting agency plus two years of hematology experience in an acceptable laboratory.

Students should contact the American Society of Clinical Pathologists, Board of Registry, P.O. Box 4872, Chicago, Illinois 60680, for details concerning their eligibility to write the hematology examination.

The curriculum in hematology does not incorporate a clinical or applied study component, but is primarily designed for one who works in this field, giving him the opportunity to earn a baccalaureate degree with a concentration in his area of interest.

The Medical Laboratory Science Professional Courses, numbered in the 87.100 and 87.200 series, will be offered directly through the College of Pharmacy and Allied Health Professions. Students must register as Special Students of that basic college and tuition will be the same as that charged for all basic college Medical Laboratory Science Professional Courses.

FIRST YEAR

Course Number			Course	quarter hours
10.307,	10.308		College Algebra & Trigonometry I, II	8
12.544,	12.545,	12.546	General Chemistry I, II, III	6
12.547,	12.548,	12.549	General Chemistry Lab. I, II, II	3
30.603			Composition & Rhetoric I & II	4
30.606			Introduction to Literary Forms	4
87.100			Medical Laboratory Science Orientation	1

SECOND YEAR

Course Number			Course	quarter hours
18.511,	18.512,	18.513	Biology I, II, III	12
			Humanities Elective	6
**12.531,	12.532,	12.533	Analytical Chemistry I, II, III and } or equiv.	6
12.524,	12.525,	12.526	Analytical Chemistry Lab. I, II, III }	6

THIRD YEAR

87.101			Basic Medical Laboratory Science	4
	87.102	*87.103	Basic Hematology; Basic Blood Banking	
		87.103	or Elective	4
87.105			Basic Medical Laboratory Chemistry and Instrumentation	4
87.121			Quality Control	2
18.557,	18.558,	18.559	Genetics	6

FOURTH YEAR

18.524,	18.525,	18.526	Human Anatomy and Physiology I, II, III	9
			Social Science Elective	6
18.521,	18.522,	18.523	Microbiology I, II or	8
			Med. Microbiology (4) and Elective (4)	8

FIFTH YEAR

86.502			Hospital Law and Ethics	2
	87.542,	87.543	Morphologic Hematology I, II	4
12.531,	12.532,	12.533	Organic Chemistry I, II, III	6
12.534,	12.535,	12.536	Organic Chemistry Lab. I, II, III	6
			Social Science Elective	6

SIXTH OR SEVENTH YEAR

**11.304,	11.305,	11.306	General Physics I, II, III or Elective	6
87.211			Coagulation	3
	87.213		Immunohematology	2
		87.222	Histochemistry	3
18.531,	18.532,	18.533	Cell Biology I, II, III	6
			Humanities Elective	6

*Students with extensive laboratory experience in a hematology laboratory, *may* be exempt from these courses.

**An. Chem. and Physics recommended for students applying to graduate school.

SIXTH OR SEVENTH YEAR

86.574, 86.575	Health, Disease, & Disability or	4
	Instrumentation or Electronics	6
	Elective	6
87.203	Med. Immunology-Serology (Intensive)	2
87.204	Hem. Parasitology	2
87.190	Undergrad Research	2
87.547	Med. Lab. Science Educ. Sem.	2
87.546	Ed. or Adm. Health Science Elective	6
	Total B.S. Degree	**175**

Note: Strongly recommended electives are: Psychology, Economics

RADIOLOGIC TECHNOLOGY

Associate in Science Degree

The program in Radiologic Technology is a joint offering of the University and several area hospitals. The classroom experiences are provided by the University, and the laboratory practicum is conducted at approved Hospital Schools of Radiologic Technology. These are accredited by the Council on Medical Education of the American Medical Association. The Committee on Radiologic Technology Education of the Massachusetts Radiological Society and the Massachusetts Society of Radiologic Technologists serve in advisory capacities concerning curriculum content.

The Radiologic Technologist is a respected member of the allied health team in the diagnostic and therapeutic environment of the clinic or hospital, and an important functionary in the production, quality control, and inspection laboratories of the industrial community. Medically related responsibilities demand effective rapport with internists, surgeons, pathologists, nurses, and laboratory personnel while industrial competency requires close association with metallurgists, production and manufacturing specialists, engineers, and scientists.

Prerequisite: Satisfactory completion of the Mathematics Placement Test or the Basic Mathematics I and II courses (10.330 and 10.331) and acceptance of an A. M. A. accredited School of Radiologic Technology which is affiliated with Northeastern University.

Have an interview with the Radiological Technology Program Director, 437-2818, 2819.

Be accepted to the affiliated hospital through an interview with the Radiologist.

FIRST YEAR

All students begin the program in July. During the first 12 weeks, students spend two days at Northeastern University and three days at the affiliated hospital doing a clinical practicum. This is followed by two alternating twelve-week terms of full-time didactic study at Northeastern University and two twelve-week terms of full-time radiologic practicum and seminars at the affiliated Hospital Schools.

Didactics — 24 weeks (at Northeastern University)

Course Number	Course	quarter hours
10.391, 10.392	Mathematics A, B	6
18.570, 18.571	Gross Anatomy and General Physiology I, II	6

(Continued on following page.)

86.620,	86.621	Radiologic Technology Orientation I, II	4
86.622,	86.623	Radiological Science I, II	8
86.624,	86.625	Principles of Radiology I, II	8
86.626,	86.627	Radiologic Photography & Exposure I, II	8
Practicum — 28 weeks (at Hospital Schools of Radiologic Technology)			
	86.647	Radiology Practicum	12

SECOND YEAR

Full-time attendance at the affiliated Hospital Schools of Radiologic Technology (52 wks @ 40 hrs/wk = 2080 hrs).

Students who satisfactorily complete the first and second year of didactics and practicum are eligible to take the American Radiologic Technology examination for certification as a Radiologic Technician (R.T.).

THIRD YEAR

Three Quarters (36 weeks) part-time evening study at University College.*

Course Number			Course	quarter hours
18.511,	18.512,	18.513	Biology I, II, III	12
30.601,	30.602		Composition & Rhetoric I, II	4
			English Elective	2
86.614,	86.615,	86.616	Adv. Radiologic Technology I, II, III	6

FOURTH YEAR

19.501,	19.502,	19.503	Psychology I, II, III or	
21.501,	21.502,	21.503**	Sociology I, II, III	6
45.501,	45.502,	45.503	Management & Organization I, II, III	6
86.617,	86.618,	86.619	Radioactive Isotopes & Therapy I, II, III	6
			Humanities Elective I, II, III	6
			Total A.S. degree	**100**

Qualified students may accelerate completion of the program by enrolling in third or fourth year evening courses during the second internship year upon petition for approval by the Director of Radiologic Technology in University College or the Radiologist in charge of the Hospital School of Radiologic Technology involved.

*These courses may now be completed on a full-time day basis, enabling the students to complete the above program in 27 months. For details please contact the Radiological Technology Program Director, 437-2818.

**21.601, 21.602 Principles of Sociology I, II (8 q.h.) may be substituted for 21.501, 21.502, 21.503 Sociology I, II, III (6 q.h.).

education

GENERAL OBJECTIVES

The teacher education program in University College is deeply concerned with the quality of those who teach. In the paragraphs that follow, quality is generally described and the several ways of assessing it are outlined.

Objective I: *Every teacher should be broadly educated.*

All students are expected to develop breadth in their program in two ways. First, students will be required to complete certain common course work: social science, United States history, American literature, effective speaking, human development, and English. Second, all students must complete a minimum of 16 credits in each of the following areas: science and mathematics, humanities, and social sciences.

Objective II: *Every teacher should achieve an expertness in some field of knowledge.*

The Teacher Education Program in University College offers an academic major in the field of English. The major is designed to prepare English teachers for the junior or senior high school. It will also provide a basis for specialized graduate study in English as well as in education.

Objective III: *Each teacher should be professionally prepared for the position of his choice.*

In addition to their general education and specialized concentration, all students will share some common professional course work with related out-of-class experience and, in addition, will take course work appropriate to their level or field of teaching. Student teaching during the senior year will serve as an opportunity to apply what has been learned in the previous years. Beginning students will have about two years to estimate their abilities to master college work, to discover the wisdom of their choice of a major field, and to evaluate the strength of their commitment to, and qualifications for, teaching.

Admission Requirements

Important to the future teacher is strong ability in the communication skills and adequate strength in the field of special interest. As important as the pattern and quality of an applicant's preparation are the personal qualifications which contribute to success in teaching.

Upon completion of all courses (or their equivalent) listed under Quarters 1–6 on p. 157, students desiring certification must apply to the College of Education* for admission to the professional sequence of the teacher education program. They will be expected to present such evidence as the College of Education shall require. Evaluations will be made on academic aptitude, verbal fluency, interest in working with young people, and emotional maturity. A serious attempt will be made to assess these factors in their interrelationships rather than as isolated phenomena. Students accepted into the professional sequence of the College of Education will be expected to commit themselves to the remaining requirements of the program.

Transfers

Students admitted to advanced standing in University College (see p. 34) may apply for admission to the professional sequence on the basis of satisfactory grades received in courses which are the equivalent of those required for entering Quarter 7 (see p. 157). Credit toward electives may be earned by means of the College Level Examination Program (see p. 35).

GRADUATION REQUIREMENTS

Degrees

University College will award the degree of Bachelor of Science to those who successfully complete the program of preparation for teaching English at the secondary school level.

Quantitative Requirements

The required courses in the curriculum for the teaching of English are listed on a following page. The curriculum requires not less than 173 quarter hours of class work, including one quarter of student teaching. At least 45 quarter hours will be required in education, including student teaching.

Elective Courses

Elective courses, approved by the College of Education adviser, will be selected by the student from among courses in University College,

*One of the Basic (day) Colleges of Northeastern University.

or credit may be earned by means of the College Level Examination Program.

Qualitative Requirements

Students in the Teacher Education Program in University College will be expected to maintain an overall average of C while doing work of C+ or better in the field of specialization and in the professional sequence in order to be recommended for placement. Students are warned that any failure seriously handicaps their records and must be made up at the earliest opportunity.

Graduation with Honor

Candidates of distinctly superior achievement in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University at least six quarters before they may become eligible for honors at graduation.

National Teacher Examinations

All students who plan to make teaching their career will be expected to take the general and special National Teacher Examinations in their senior year.

Programs of Instruction

The teacher education program in University College offers an academic major in the field of English (in grades 7–12). A specimen program is shown on the following page.

Accreditation

Northeastern University's College of Education is accredited by the National Council for Accreditation of Teacher Education. The College is a member of the American Association of Colleges for Teacher Education.

SPECIMEN PROGRAM IN TEACHING OF ENGLISH (GRADES 7–12)

This program is designed with the assumption that the student is attending college on approximately a half-time basis.

First Year

QUARTER 1

No.	Course	Cl.	q.h.
16.501	Nat. Sci. I	2	2
23.501	West. Civ. I	2	2
29.501	Eff. Spkg. I	2	2
30.601	Comp. & Rhet. I*	2	2

QUARTER 2

No.	Course	Cl.	q.h.
16.502	Nat. Sci. II	2	2
23.502	West. Civ. II	2	2
29.502	Eff. Spkg. II	2	2
30.602	Comp. & Rhet. II	2	2

QUARTER 3

No.	Course	Cl.	q.h.
16.503	Nat. Sci. III	2	2
23.503	West. Civ. III	2	2
29.503	Eff. Spkg. III	2	2
30.604	Intro. to Lit. Forms I	2	2
			24

Second Year

QUARTER 4

No.	Course	Cl.	q.h.
22.501	Prin. Pol. Sci. I	2	2
30.605	Intro. to Lit. Forms II	2	2
50.111	Soc. Sci. I	3	3

QUARTER 5

No.	Course	Cl.	q.h.
22.502	Prin. Pol. Sci. II	2	2
	English Elective	2	2
50.112	Soc. Sci. III	3	3

QUARTER 6

No.	Course	Cl.	q.h.
22.503	Prin. Pol. Sci. III	2	2
	English Elective	2	2
50.113	Soc. Sci. III	3	3
			21
	Total Credits		**45**

*Students desiring certification must now apply to the College of Education** for admission to the teacher education program.*

Third Year

QUARTER 7

No.	Course	Cl.	q.h.
23.527	England 500–1603	2	2
26.501	Intro. Phil. I	2	2
30.525	English Language I	2	2
39.501	Ec. Prin. & Prob. I	2	2

QUARTER 8

No.	Course	Cl.	q.h.
23.548	England 1603–1815	2	2
26.502	Intro. Phil. II	2	2
30.526	English Language II	2	2
39.502	Ec. Prin. & Prob. II	2	2

Fourth Year

QUARTER 10

No.	Course	Cl.	q.h.
23.504	U.S. History I	2	2
30.541	English Lit. I	2	2
50.121	Hum. Dev. & Learn. I	4	4

QUARTER 11

No.	Course	Cl.	q.h.
23.505	U.S. History II	2	2
26.534	Logic	2	2
30.542	English Lit. II	2	2
	Electives	2	2

*An English placement examination must be taken. If the score is not satisfactory, students should enroll for 30.600 Elements of Composition, a 2 q.h. credit course designed to improve command of written English. Then proceed with 30.601, 602, 603, 604 and a 2 q.h. English elective in Quarter 6.

**One of the Basic (day) Colleges of Northeastern University

QUARTER 9

No.	Course	Cl.	q.h.
23.549	England Since 1815	2	2
26.503	Intro. Phil. III	2	2
30.527	English Language III	2	2
39.503	Ec. Prin. & Prob. III	2	2
			24

Fifth Year

QUARTER 13

No.	Course	Cl.	q.h.
30.522	Intro. Semantics I	2	2
30.544	Amer. Lit. I	2	2
51.135	Anal. Tchng. & Ed. Proc.	4	4

QUARTER 14

No.	Course	Cl.	q.h.
30.523	Intro. Semantics II	2	2
30.545	Amer. Lit. II	2	2
	Electives	4	4

QUARTER 15

No.	Course	Cl.	q.h.
	Elective	2	2
30.546	Amer. Lit. III	2	2
54.126	Sec. Reading	4	4
			24

Seventh Year

QUARTER 19

No.	Course	Cl.	q.h.
	Sci. or Math. Elec.	2	2
	Art Music or Thea. Arts	2	2
50.151	Bckgrnds. Amer. Ed.	4	4

QUARTER 20

No.	Course	Cl.	q.h.
	Sci. or Math. Elec.	2	2
	Art Music or Thea. Arts	2	2
	Electives	4	4

QUARTER 21

No.	Course	Cl.	q.h.
	Sci. or Math. Elec.	2	2
	Art Music or Thea. Arts	2	2
50.143	M&M—English	4	4
			24

QUARTER 12

No.	Course	Cl.	q.h.
23.506	U.S. History III	2	2
30.543	English Lit. III	2	2
50.131	Hum. Dev. & Learn. II	4	4
			24

Sixth Year

QUARTER 16

No.	Course	Cl.	q.h.
30.517	Intermed. Wrtg.	2	2
30.554	Shakespeare I	2	2
50.141	Meas. & Eval.	4	4

QUARTER 17

No.	Course	Cl.	q.h.
30.518	Creative Wrtg. I	2	2
30.555	Shakespeare II	2	2
	Electives	4	4

QUARTER 18

No.	Course	Cl.	q.h.
30.519	Creative Wrtg. II	2	2
30.556	Shakespeare III	2	2
	Electives	4	4
			24

Eighth Year

QUARTER 22

No.	Course	Cl.	q.h.
51.151	Student Teaching		8
			8
Total Credits			**173**

therapeutic recreation services

for Nursing Home Activity Directors

Prof. Frank Robinson, Consultant
Therapeutic Recreation Services
Telephone 437-3157

A certification and degree program for nursing home activity directors and others is offered by University College. The program is designed to meet the needs of directors of activity in the Commonwealth's nursing homes and the needs of others entering this occupational field in the future.

The part-time program, leading to certification and an Associate degree, will be taught by the distinguished faculty of Northeastern University's Boston-Bouvé College. Courses offered will be in the areas of therapeutic recreation services, the process of aging, arts and crafts, social recreation, geriatric care, utilization of resources, and many other professional courses.

CURRICULUM

I. Certification—25 quarter hours
Professional courses

II. Associate Degree—96 quarter hours

Psychology	2 q.h.
Social Sciences	8 q.h.
Fine Arts	3 q.h.
Speech & Theatre Arts	4 q.h.
English	2 q.h.
Health Care Science	8 q.h.
Professional	51 q.h.
Electives	18 q.h.

THERAPEUTIC RECREATION SERVICES

Associate in Science Degree

		quarter hours	
Required Courses (Liberal Arts)			
19.501	Psychology I	2	
21.501, 21.502, 21.503	Sociology I, II, III	6	
21.563	Social Gerontology	2	
27.541	Drawing I	3	
29.501	Effective Speaking I	2	
29.511	Introduction to Theatre Arts	2	
30.601	Composition and Rhetoric I	2	19
Required Courses (Health Care Services)			
86.571, 86.572, 86.573	Long-Term Care Administration I, II, III	6	
86.577	Geriatric Care I	2	8

Required Courses (Therapeutic Recreation Services)

A.S. degree candidates must complete 51 quarter hours of credit, selected from the professional courses listed below.

Note: Twenty-five (25) quarter hours of credit in the following professiona courses will qualify a student for certification by Boston-Bouvé College

63.501	Introduction to Therapeutic Recreation Services	2
63.505	The Nursing Home Experience	2
63.510	Philosophy of Recreation and Leisure	2
63.521	Recreation Skills I (Social Recreation)	2
63.522	Recreation Skills II (Music Therapy)	2
63.523	Recreation Skills III (Guitar or Auto Harp)	2
63.524	Recreation Skills IV (Intermediate Guitar)	2
63.531	Techniques of Recreation Leadership	2
63.532	Interagency Planning for Community Action	2
63.535	Recreation Skills VI (Special Events and Programs)	2
63.540, 63.541	Analysis of Movement as Applied to Recreation I, II	4
63.547	Outdoor Education for Handicapped	2
63.549	The Process of Aging	2
63.550, 63.551	Group Dynamics I, II	4
63.552	Leadership and Program for III, Aged, and Infirm	2
63.553	Techniques and Resources in Working with Elderly	2
63.555	Therapeutic Recreation for Special Groups	2
63.556	Workshop in Adapted Hospital Recreation	2
63.557	Recreation Activities of Atypical Individuals and Groups	2
63.559	Group Dynamics (Intensive)	4
63.560	Development and Utilization of Recreation Education Resources	2

(Continued on following page.

63.565,	63.566		Social and Psychological Impacts of Disabilities I, II	4	
63.567			Social and Psychological Impacts of Disabilities (Intensive)	4	
63.570,	63.571,	63.572	Arts and Crafts I, II, III	6	
63.573			Arts and Crafts (Intensive)	4	
63.592			Independent Study	3	
63.593			Independent Study	4	
63.600			Seminar in Group Dynamics	2	**51**
Elective Courses*					**18**
			Total Credits		**96**

*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog.

course descriptions

Not all the courses listed in this bulletin will be offered. A final list of those classes to be offered will be contained in the University College Schedule of Courses, which gives the hours, days, and location of classes. This schedule is issued prior to the Fall, Winter, Spring, and Summer Quarters.

Abbreviations

Q.H. = Quarter Hours (credit earned)
Cl. = Hours required in class per week
Prereq. = Prerequisite

10—MATHEMATICS (Lincoln College)

Students intending to enroll in Mathematics 10.327 or 10.335 will be given a Mathematics Placement Test during the registration period. A satisfactory score on this test will entitle the student to enroll in course 10.327 or 10.335, while an unsatisfactory score will require that he enroll in the non-credit course 10.330 for additional preparation.

10.301 Introduction to Mathematics I (4 cl., non-credit)
A comprehensive review of high school algebra including: first degree equations, factoring, fractions, fractional equations, ratio and proportion, word problems, and concepts of plane geometry. *Prereq. none.*

10.302 Introduction to Mathematics II (4 cl., non-credit)
Algebraic operations with complex fractions, mixed expressions, proportions, square roots, radicals, quadratic equations, simultaneous equations, graphs, and fractional zero and negative exponents. The geometry of the right triangle. areas of polygons and circles, and loci problems. Basic slide rule operation. *Prereq. 10.301.*

10.303 Introduction to Mathematics (3 cl., non-credit)
An accelerated combination of 10.301 and 10.302. (Day Curriculum.)

10.307 College Algebra and Trigonometry I (4 cl., 4 q.h.)
Fundamental algebraic operations; complex numbers; radicals and exponents; functions; linear and quadratic equations; irrational equations; inequalities; variations; roots of polynomial equations. *Prereq. Math. Placement Test or 10.302.*

10.308 College Algebra and Trigonometry II (4 cl., 4 q.h.)
Logarithms; trigonometric functions of angles in degrees and radians; trigo-

nomentric identities and equations; right triangles; oblique triangles; complex numbers in trigonometric form; systems of equations; determinants. *Prereq. 10.307.*

10.316 Probability and Statistics I (2 cl., 2 q.h.)
Basic tools, e.g., sets, permutations and combinations; probability and applications. *Prereq. 10.308 or 10.329 or 10.335.*

10.317 Probability and Statistics II (2 cl., 2 q.h.)
Descriptive statistics, frequency distributions and probability density functions, normal and other distributions. *Prereq. 10.316.*

10.318 Probability and Statistics III (2 cl., 2 q.h.)
Bivariate distributions, correlation, statistical inference, and estimation regression. *Prereq. 10.317.*

10.320 Calculus I (4 cl., 4 q.h.)
Plane analytic geometry. Differentiation of algebraic functions. Rate, motion, maximum and minimum problems. Derivatives of higher order. Curve sketching. Basics in functions, limits, and continuity. *Prereq. 10.308 or 10.329.*

10.321 Calculus II (2 cl., 2 q.h.)
Integration of algebraic functions. Integration and differentiation of logarithmic, exponential, and trigonometric terms. Calculations of areas, volumes, and length of arc by definite integrals. *Prereq. 10.320.*

10.322 Calculus III (2 cl., 2 q.h.)
Differentiation and integration of inverse trigonometric functions. Integration by parts, substitution, and tables. The Trapezoidal and Simpson Rules. The application of the differential and integral calculus to the Polar Coordinate System. Indeterminate forms. *Prereq. 10.321.*

10.323 Calculus IV (2 cl., 2 q.h.)
Vectors in the plane, vectors in three-dimensional space. Functions of more than one variable. Partial differentiation. Multiple integration. Infinitive series. Taylor's and Maclaurin's Formula. *Prereq. 10.322.*

10.324 Differential Equations I (2 cl., 2 q.h.)
Vector analysis; matrices and linear algebra. *Prereq. 10.323.*

10.325 Differential Equations II (2 cl., 2 q.h.)
Ordinary differential equations — standard types of the first order; linear differential equations, especially with constant coefficients. Variation of parameters. *Prereq. 10.324.*

10.326 Differential Equations III (2 cl., 2 q.h.)
Series solutions of differential equations; Laplace transforms; Fourier series and orthogonal functions. *Prereq. 10.325.*

10.327 Mathematics I (2 cl., 2 q.h.)
Methods and applications of algebra, graphical techniques. *Prereq. Math. Placement Test, 10.331 or 10.302.*

10.328 Mathematics II (2 cl., 2 q.h.)
Linear and quadratic equations, exponents and radicals, variation. *Prereq. 10.327.*

10.329 Mathematics III (2 cl., 2 q.h.)
Introductory topics of probability and statistics; logarithms and applications; mathematics of finance. *Prereq. 10.328.*

10.330 Basic Mathematics I (2 cl., non-credit)
A review of elementary algebra; algebraic expressions and operations, equations, word problems. *Prereq. none.*

10.331 Basic Mathematics II (2 cl., non-credit)
Further review; operations with polynomials, factoring, fractional expressions. word problems. *Prereq. 10.330.*

10.332 Mathematics for Business Management I (2 cl., 2 q.h.)
Topics of mathematics applicable to business management. Logic; set theory; probability and its uses in decision making under uncertainty. *Prereq. 10.329 or equiv.*

10.333 Mathematics for Business Management II (2 cl., 2 q.h.)
Statistical methods; mathematics of finance; introduction to vector and matrix algebra. *Prereq. 10.332 or equiv.*

10.334 Mathematics for Business Management III (2 cl., 2 q.h.)
Linear programming and optimization techniques; applications of matrix algebra; game theory. *Prereq. 10.333 or equiv.*

10.351 Advanced Mathematics I (Numerical Analysis) (2 cl., 2 q.h.)
Basic methods of numerical analysis — roots by iteration; approximating polynomials and interpolation; least squares fitting; numerical integration; approximate solution of ordinary differential equations — problems employing the electronic computer. *Prereq. 09.353 and 10.326.*

10.352 Advanced Mathematics II (2 cl., 2 q.h.)
Introduction to partial differential equations, boundary-value problems, Sturm-Liouville systems. *Prereq. 10.351.*

10.353 Advanced Mathematics III (2 cl., 2 q.h.)
Special topics in analysis. *Prereq. 10.352.*

10.361 Modern Algebra I (2 cl., 2 q.h.)
Sets; binary operations; mappings; rings, integers, fields; rationals; reals, bases for computer applications; Euclidean algorithm; primes. *Prereq. 10.308, 10.329, or 10.335.*

10.362 Modern Algebra II (2 cl., 2 q.h.)
Field of complex number; groups; subgroups; polynominal rings; homomorphisms; isomorphisms; ideals. *Prereq. 10.361.*

10.363 Modern Algebra III (2 cl., 2 q.h.)
Vector spaces; linear transformations; dependence, independence; dimension applications to engineering, science, and business. *Prereq. 10.362.*

10.364 Modern Applied Algebra (4 cl., 4 q.h.)
Introduce the language of abstract algebra to the following topics: graphs, finite state machines, programming languages, Boolean Algebra, lattices, coding for communication channels, and radar. Look at algebraic theory of linear systems. *Prereq. 10.361, 10.362 and 10.363.*

10.401 Foundations of Mathematics I (2 cl., 2 q.h.)
(See General Interest Courses, pages 159–161.)

10.402 Foundations of Mathematics II (2 cl., 2 q.h.)
(See General Interest Courses, pages 159–161.)

10.403 Foundations of Mathematics III (2 cl., 2 q.h.)
(See General Interest Courses, pages 159–161.)

10.421 Calculus — A (4 cl., 4 q.h.)
Applications of derivatives to curve-sketching; antidifferentiation; the definite integral, with applications; calculus of non-algebraic functions — logarithmic, exponential, and trigonometric. Calculus of inverse trigonometric functions; techniques of integration; polar coordinates; the conic sections; vectors in a plane; indeterminate forms, L'Hospital's Rule. *Prereq. 10.320.*

10.422 Calculus — B (3 cl., 4 q.h.)
Calculus of functions of several variables, partial differentiation, multiple integrals, infinite series. Vector analysis; matrices and linear algebra. *Prereq. 10.421.*

10.423 Differential Equations (4 cl., 4 q.h.)
Ordinary differential equations — standard types of the first order; linear differential equations, especially with constant coefficients; Laplace transforms, series solutions of differential equations. Fourier series and orthogonal functions. *Prereq. 10.422.*

11—PHYSICS (Lincoln College)

11.301 Introductory Physics I (4 cl., non-credit)
A survey of physical principles and theories related to field of mechanics. Emphasis is placed upon the solution of applied problems. *Prereq. None.*

11.302 Introductory Physics II (4 cl., non-credit)
Extension of principles in mechanics and introduction of concepts in heat, sound, light, electricity, and magnetics. *Prereq. 11.301.*

11.304 General Physics I (2 cl., 2 q.h.)
Survey of Newtonian mechanics; kinematics and dynamics of particle motion; projectile and circular motion; rotational motion; conservation laws of energy and momentum. *Prereq. 10.501 or concurrently.*

11.305 General Physics II (2 cl., 2 q.h.)
Temperature; heat energy; mechanical equivalent of heat; wave motion; sound; Doppler's effect; properties of light; simple optical systems. *Prereq. 11.304.*

11.306 General Physics III (2 cl., 2 q.h.)
Fundamentals of electricity and magnetism; fields; potential; electric current; inductance; capacitance; electromagnetism; a-c and d-c series circuits. *Prereq. 11.305.*

12—CHEMISTRY

Consultant: Prof. K. Weiss, Chairman, Chemistry Dept. (L.A. College)
Course Coordinator: Prof. F. Boig, (L.A. College)

12.501 Introductory Chemistry I (4 cl., non-credit)
A non-mathematical approach to the concepts of chemistry including matter, elements, and compounds, chemical bonding, chemical equations. *Prereq. None.*

12.502 Introductory Chemistry II (4 cl., non-credit)
A continuation of 12.501, including periodic system, forms of energy, oxidation reduction, solutions, chemical and ionic equilibrium, nuclear reactions, and a brief introduction to organic chemistry. *Prereq. 12.501 or equiv.*

12.507 Modern Chemistry I (Intro. to Inorganic Chemistry) (2 cl., 2 q.h.)
Fundamental ideas of matter and energy, chemical bonding, chemical energy, water and solutions, colloids, ionic reactions, oxidation and reduction, acidity, radioactivity; all discussed from the viewpoint of recent developments.

12.508 Modern Chemistry II (Intro. to Organic Chemistry), (2 cl., 2 q.h.)
Classes of organic compounds, including hydrocarbons, alcohols, ethers, aldehydes, ketones, carboxylic acids, esters, amines and amides, carbohydrates; including their relationships with modern biology. *Prereq. 12.507 or equiv.*

12.509 Modern Chemistry III (Intro. to the Chemistry of Living Bodies) (2 cl., 2 q.h.)
Includes fats, proteins, enzymes, chemistry of digestion, and the chemical reactions characteristic of body fluids. *Prereq. 12.508 or equiv.*

12.515 Biochemistry I (2 cl., 2 q.h.)
The first quarter of a three-quarter course sequence. The sequence will cover introduction to the biochemistry of the cell, including the occurrence, chemistry, and metabolism of carbohydrates, lipids, proteins, and nucleic acids. *Prereq. 12.533 or equiv.*

12.516 Biochemistry II (2 cl., 2 q.h.)
Continuation of Biochemistry I. *Prereq. 12.515 or equiv.*

12.517 Biochemistry III (2 cl., 2 q.h.)
Continuation of Biochemistry II. *Prereq. 12.516 or equiv.*

12.518 Modern Chemistry Laboratory 1 (2 lab, 1 q.h.)
Coordinated with the lecture course, Modern Chemistry I, and deals with the preparation, properties, and reactions of substances discussed. *Prereq. 12.507 taken concurrently.* (Laboratory fee)

12.519 Modern Chemistry Laboratory II (2 lab, 1 q.h.)
Coordinated with the lecture course, Modern Chemistry II, and deals with the preparation, properties, and reactions of substances discussed. *Prereq. 12.518 (or 12.508 taken concurrently).* (Laboratory fee)

12.520 Modern Chemistry Laboratory III (2 lab, 1 q.h.)
Coordinated with the lecture course, Modern Chemistry III. *Prereq. 12.519 (or 12.509 taken concurrently).* (Laboratory fee)

12.521 Analytical Chemistry I (2 cl., 2 q.h.)
Analytical procedures and techniques. The principles of solution chemistry, ionic equilibria, and oxidation potentials applied to solving problems in chemical analysis. *Prereq. 12.546 and 12.549 or equiv.*

12.522 Analytical Chemistry II (2 cl., 2 q.h.)
Principles and practice of gravimetric and titrimetric methods of analysis. *Prereq. 12.521 or equiv.*

12.523 Analytical Chemistry III (2 cl., 2 q.h.)
Theory of spectrophotometry, chromatography, and selected electroanalytical methods. *Prereq. 12.522 or equiv.*

12.524 Analytical Chemistry Laboratory I (3 lab, 2 q.h.)
Qualitative analysis; separations by chemical means, chemical tests, and spot tests for inorganic ions in solution. *Prereq. 12.521 (or taken concurrently) or equiv.* (Laboratory fee)

12.525 Analytical Chemistry Laboratory II (3 lab, 2 q.h.)
Chemical methods of quantitative analysis. Procedures and techniques of gravimetric and volumetric methods of chemical analysis. *Prereq. 12.522 (or taken concurrently) or equiv.* (Laboratory fee)

12.526 Analytical Chemistry Laboratory III (3 lab, 2 q.h.)
Instrumental methods of analysis; instruments and procedures for electrometric and optical methods of chemical analysis. *Prereq. 12.525 and 12.523 (or taken concurrently) or equiv.* (Laboratory fee)

12.527 Analytical Chemistry (Lectures and lab, 4 q.h., Summer Quarter only)
Survey of principles and theories of volumetric, gravimetric, and instrumental analysis. Application made in the laboratory with analyses of unknown samples. *Prereq. General Chemistry or equiv.*

12.531 Organic Chemistry I (2 cl., 2 q.h.)
Nature of carbon in organic compounds. General principles of structure, nomenclature, preparation, uses, and reactions, of aliphatic hydrocarbons: alkanes, alkenes, alkynes, dienes, cycloalkanes. Position and geometric isomerism. Intro-

duction to free radical and ionic mechanisms of reactions. *Prereq. 12.546 and 12.549 or equiv.*

12.532 Organic Chemistry II (2 cl., 2 q.h.)
Structure of benzene, electrophilic aromatic substitution reactions. General principles of structure, nomenclature, preparation, uses, and reactions of the various types of organic compounds, including: alcohols, alkyl and aryl halides, ethers and epoxides, and carboxylic acids. Optical isomerism and introductory chemical kinetics will be discussed. *Prereq. 12.531 or equiv.*

12.533 Organic Chemistry III (2 cl., 2 q.h.)
Continuation of Chemistry 12.532 with emphasis on the application of chemical conversions to synthetic problems. Functional derivatives of carboxylic acids, sulfonic acids and their derivatives, amines, diazonium compounds, phenols, aldehydes, and ketones. *Prereq. 12.532 or equiv.*

12.534 Organic Chemistry Laboratory I (3 lab, 2 q.h.)
Coordinated with the lecture course, Organic Chemistry I, and deals with the preparation and properties of compounds discussed. *Prereq. 12.546 or equiv. and 12.531 (or taken concurrently) or equiv.* (Laboratory fee)

12.535 Organic Chemistry Laboratory II (3 lab, 2 q.h.)
Coordinated with the lecture course, Organic Chemistry II, and deals with the preparation and properties of compounds discussed. *Prereq. 12.534 or equiv.* (Laboratory fee)

12.536 Organic Chemistry Laboratory III (3 lab, 2 q.h.)
Coordinated with the lecture course, Organic Chemistry III, and deals with the preparation and properties of compounds discussed. *Prereq. 12.535 or equiv.* (Laboratory fee)

12.541 Physical Chemistry I (2 cl., 2 q.h.)
The three states of matter, atomic and molecular forces, physical properties, and molecular structure; heat, work, and heat capacity; thermochemistry. *Prereq. 10.323, 11.306, and 12.546 plus 12.549 or equiv.*

12.542 Physical Chemistry II (2 cl., 2 q.h.)
Thermodynamics, solutions, chemical equilibria, phase diagrams, and chemical kinetics. *Prereq. 12.541 or equiv.*

12.543 Physical Chemistry III (2 cl., 2 q.h.)
Electrical conductance, electromotive force, ionic equilibria, colloids, quantum theory, and photochemistry. *Prereq. 12.542 or equiv.*

12.544 General Chemistry I (2 cl., 2 q.h.)
Fundamental concepts; symbols, formulas, and equations; atomic structure and Periodic Law; chemical bonding; oxygen, ozone, and hydrogen; the gaseous state and gram mole volume; the liquid and solid states; water and hydrogen peroxide. *Prereq. 10.327 or equiv. (or taken concurrently). (Not open to those students with credit for 12.311 or 12.314.)*

12.545 General Chemistry II (2 cl., 2 q.h.)
Solutions, solutions of electrolytes, colloids, oxidation and reduction reactions, periodic properties, halogens, chemical equilibrium, electrochemistry; acids, bases, and salts; sulfur family. *Prereq. 12.544 or equiv. (Not open to those students with credit for 12.312 or 12.315.)*

12.546 General Chemistry III (2 cl., 2 q.h.)
Ionic equilibrium and weak electrolytes; solubility product principle; hydrolysis. Nitrogen, phosphorus, and their compounds; boron, silicon, and their compounds; alkali and alkaline earth metals; metals of groups III and IV. Nuclear chemistry. Carbon and its compounds. Biochemistry. *Prereq. 12.545; or equiv. (Not open to students with credit for 12.313 or 12.316.)*

12.547 General Chemistry Laboratory I (2 lab, 1 q.h.)
Coordinated with the lecture course, General Chemistry I, and deals with the preparation and properties of elements and compounds discussed. *Prereq. 12.544 (or taken concurrently) or equiv. (Not open to those students with credit for 12.314.)* (Laboratory fee)

12.548 General Chemistry Laboratory II (2 lab, 1 q.h.)
Coordinated with the lecture course, General Chemistry II, and deals with the preparation and properties of elements and compounds discussed. *Prereq. 12.547 or equiv. (Not open to those students with credit for 12.315.)* (Laboratory fee)

12.549 General Chemistry Laboratory III (2 lab, 1 q.h.)
Qualitative analysis experiments, including unknown solutions. *Prereq. 12.548 or equiv. (Not open to those students with credit for 12.316.)* (Laboratory fee)

12.550 Chemistry for the Citizen (2 cl., 2 q.h.)
The objective of the course is to give the non-science student an appreciation and some knowledge of the role of chemistry in our technological society and in our everyday lives. To provide background for subsequent discussion; important laws and theories relating to matter and its transformations will be reviewed. There will then follow discussion of the chemistry of such basic human needs as food, clothing, shelter, transportation, and energy production. Other topics may be included or substituted, since students will participate in the selection of subjects for discussion. *Prereq. none.*

12.551 Instrumental Analysis I (formerly Instrumental & Radiochemistry I) (2 cl., 2 q.h.)
Basic theory and instruments used in electrochemical analysis. Course includes such topics as electrode and cell potentials, potentiometric titrations, direct potentiometry (pH meters and specific ion electrodes), coulometry, polarography, amperometry, electrogravimetry, and conductivity. *Prereq. 12.523 or equiv.*

12.552 Instrumental Analysis II (formerly Instrumental & Radiochemistry II) (2 cl., 2 q.h.)
Basic theory and instruments used in spectrochemical analysis. Course includes such topics as electromagnetic spectrum, ultraviolet and visible spectrophotometry, infrared spectrophotometry, X-ray analysis, fluorescence and phos-

phorescence, emission spectrophotometry, absorption spectrophotometry, and gas chromatography. *Prereq. 12.551 or equiv.*

12.553 Radiochemistry (formerly Instrumental & Radiochemistry III) (2 cl., 2 q.h.)
Radioactivity and nuclear reactions; production and study of nuclear reactions; equations of radioactive decay; nuclear states and radioactive processes; interaction of radiation with matter; radiation detection and measurement; statistics of radioactivity measurements; techniques for the study of radionuclides; tracers in chemical applications; and nuclear energy. *Prereq. 12.552 or equiv.*

12.554 Physical Chemistry Laboratory I (3 cl., 2 q.h.)
Experimental studies of viscosity, thermochemistry, and homogeneous equilibrium. *Prereq. 12.542 (or taken concurrently) or equiv.* (Laboratory fee)

12.555 Physical Chemistry Laboratory II (3 cl., 2 q.h.)
Experimental studies of phase equilibrium, solution thermodynamics, and chemical kinetics. *Prereq. 12.554 or equiv.* (Laboratory fee)

16—EARTH SCIENCE

Consultant: Prof. D. Wilmarth, Earth Sciences (L.A. College)

16.501 Introduction to Earth Sciences I (2 q.h.)
The nature and role of the sciences of the Earth; the investigations that have provided information of the Earth as an object in space; our conceptions of the dynamic nature of the Earth. *Prereq. none.*

16.502 Introduction to Earth Science II (2 q.h.)
The issue of energy; the significance of energy for the dynamics of the Earth's atmosphere, oceans, and land surfaces. *Prereq. 16.501 or equiv.*

16.503 Introduction to Earth Science III (2 q.h.)
The complex activities of the Earth's crust; the consequences of crustal dynamics, both internally and externally; the history of the dynamics of crustal activity; the origin of the Earth; structure and origin of the Solar System; the components of the Universe. *Prereq. 16.502 or equiv.*

16.504 Earth Science (Intensive) (6 q.h.)
A composite of 16.501, 16.502, 16.503 as a one-quarter course. *Prereq. none.*

16.505 Earth Science A (3 q.h.)
A composite of 16.501 and the first half of 16.502. *Prereq. none.*

16.506 Earth Science B (3 q.h.)
The second half of 16.502 and all of 16.503. *Prereq. 16.505.*

16.511 History of Science and Technology I (2 q.h.)
An analysis of the varieties of cultures and civilizations from primitive man to the Roman Empire, emphasizing the interrelationships of science, technology, and society. *Prereq. 16.503 or equiv.*

16.512 History of Science and Technology II (2 q.h.)
A continuation of History of Science and Technology I covering the period from the Roman Empire to Sir Isaac Newton. *Prereq. 16.511 or equiv.*

16.513 History of Science and Technology III (2 q.h.)
A continuation of History of Science and Technology II covering the period from Sir Isaac Newton to the present. *Prereq. 16.512 or equiv.*

16.521 Introduction to Geology (2 q.h.)
Introduction to fundamental concepts of the Earth and its crust. Consideration of the nature and properties of the materials composing the Earth; the areal distribution of these materials, and the processes by which they are formed, altered, transported, and deposited; and the nature and development of the landscape. *Prereq. 16.503 or equiv.*

16.522 Economic Mineralogy (2 q.h.)
Introduction to the geological occurrence, mineralogy, use, and economics of the more important metallic and non-metallic minerals in the world today. International mineral problems will be discussed. *Prereq. 16.503 or equiv.*

16.523 Gemology (2 q.h.)
Introduction to the precious and semiprecious minerals of the Earth's crust. Techniques of gem cutting, polishing, and faceting will be discussed in detail. Opportunity will be available to view and handle gem stones. *Prereq. 16.503 or equiv.*

16.531 Oceanology I (formerly Oceanography I) (2 q.h.)
Introduction to the origin of the global ocean; the physical and chemical properties of sea water; development of ocean currents and their effect on land masses of the world; problems of ocean pollution. *Prereq. 16.503 or equiv.*

16.532 Oceanology II (formerly Oceanography II) (2 q.h.)
The habitat zones and organisms of the sea; Phytoplankton, zooplankton, and nekton; economic importance of marine resources for expanding world population. *Prereq. 16.531 or equiv.*

16.533 Oceanology III (formerly Marine Geology) (2 q.h.)
Physiography and structure of ocean basins; marine geological processes and features; sedimentation, erosion, shorelines, and bottom topography; methods and techniques of marine geological explorations. *Prereq. 16.532 or equiv.*

16.534 Fisheries Oceanography I (2 q.h.)
Survey of commercially important marine organisms; life and distribution of commercially important seaweed, shellfish, and fishes; population dynamics and fishery potential of the world's oceans; analysis of fishery stocks and sea farming. *Prereq. 16.533 or equiv.*

16.535 Fisheries Oceanography II (2 q.h.)
Examination of fishery methods and techniques around the world; recent technological advancement. *Prereq. 16.534 or equiv.*

16.536 Fisheries Oceanography III (2 q.h.)
Commercial products and applications of marine organisms; special emphasis on marine products of commerce from the New England area; chemical, industrial, and dietary applications of marine products. *Prereq. 16.535 or equiv.*

16.537 Marine Resources I (2 q.h.)
Quantitative and qualitative consideration of energy from the marine environment: current technological developments in the use of tidal power, off-shore oil, natural gas, thermal and nuclear energy from the sea. *Prereq. 16.533 or equiv.*

16.538 Marine Resources II (2 q.h.)
Food resources of the sea; analysis of world marine food production; marine food technology, conservation, and mariculture. *Prereq. 16.537 or equiv.*

16.539 Marine Resources III (2 q.h.)
Coastal zone recreational resources: beaches, artificial fishing reefs; shore erosion; SCUBA, boating, sailing, angling, and surfing. *Prereq. 16.538 or equiv.*

16.551 Principles of Astronomy I (2 q.h.)
The nature and scope of astronomy; the geocentric universe; the heliocentric universe; celestial reference systems; time and the calendar; the sun-moon-earth system; astronomical instruments. *Prereq. 16.503 or equiv.*

16.552 Principles of Astronomy II (2 q.h.)
The Solar System; the inner planets; the outer minor planets; the outer major planets; the telescopic planets; the asteroid belt; meteors; comets; the sun as a source of energy and center of organization. *Prereq. 16.551 or equiv.*

16.553 Principles of Astronomy III (2 q.h.)
The triangulation of space; stellar population; star color and motion; star systems; stellar evolution; galaxies. *Prereq. 16.552 or equiv.*

16.554 Observational Astronomy (3 q.h.)
An introduction to the planets, stars, and constellations that are visible to the naked eye. Lectures, the planetarium, and actual viewing sessions are all used during the course. Primary emphasis will be placed on those stars and constellations easily seen from mid-northern latitudes.

16.557 Celestial Astronomy I (2 q.h.)
A thorough examination of the sun as a typical star; determination of stellar physical properties—the instrumentation and the information: size, mass, density; chemical composition, surface temperature, rotation, axial tilt, distance. *Prereq. 16.553 or equiv.*

16.558 Celestial Astronomy II (2 q.h.)
Star systems—the visual, telescopic, and spectroscopic doubles; simple star systems; stellar populations; H–R diagrams and stellar evolution; multiple stars; irregular stars; nova; nebulae. *Prereq. 16.557 or equiv.*

16.559 Celestial Astronomy III (2 q.h.)
Galactic detection; galactic distribution; forms, types, and possible galactic evolution; the MILKY WAY; inter-stellar and intergalactic space; pulsars, quasars, and black holes; cosmology. *Prereq. 16.558 or equiv.*

16.561 Physical Geography I (2 q.h.)
Physical assessment of the Earth as a spheroid; relations with the sun; geographic grid; map projections; illumination of the globe; geographic time studies and moon-tide relationships. *Prereq. 16.503 or equiv.*

16.562 Physical Geography II (2 q.h.)
Physical weather elements—temperature, pressure, moisture; cyclonic storms; role of weather elements in world climate. *Prereq. 16.561 or equiv.*

16.563 Physical Geography III (2 q.h.)
The Earth's landforms—their formation and description; particular emphasis given to the agents of deposition and erosion: the volcano, the river, the glacier, and ocean waves. *Prereq. 16.562 or equiv.*

16.567 Human and Cultural Geography (2 q.h.)
Spatial analysis of people throughout the world—their culture, culture landscapes, cultural history, and cultural ecology; provides for an understanding of differences in world populations. *Prereq. 16.563 or equiv.*

16.568 Urban Geography I (2 q.h.)
In-depth analysis of historical and present structure of cities; comparative world urbanism trends; historic city growth patterns; morphology; site and situations; central place theories; external and internal relations; economic base. *Prereq. 16.567 or equiv.*

16.569 Urban Geography II (2 q.h.)
An applied approach to urban problems through urban theories and planning techniques; vertical classification of cities; methods of city development; land utilization; land-use survey and mapping techniques; planning approaches; zoning. *Prereq. 16.568 or equiv.*

16.571 Conservation I (2 q.h.)
Philosophy of conservation; historical development of the conservation movement in the U.S. since 1900; interactions of economics and conservation practices. *Prereq. 16.503 or equiv.*

16.572 Conservation II (2 q.h.)
Problems relating to the supply, use, and management of major renewable natural resources: forests, soil, wildlife, and water. *Prereq. 16.571 or equiv.*

16.573 Conservation III (2 q.h.)
Application of the theories and techniques of conservation; problems of urban resources; air and water pollution; recreational resources; the availability of funds. *Prereq. 16.572 or equiv.*

16.574 Conservation and the Nation (2 q.h.)
In-depth study of the current practices and problems in our nation; mineral resources availability and allocation; energy resources; atmospheric, fresh and salt water pollution; wildlife and endangered species. *Prereq. 16.573 or equiv.*

16.575 Conservation and the Community (2 q.h.)
Examination of the conservation problems at the local level; identification of the problem; the factors involved; the dimension of the problem; the responsibility of the community. *Prereq. 16.574 or equiv.*

16.576 Conservation Management (2 q.h.)
Assessment of current practices of the local community; sources of knowledge and assistance among the populace; agencies available to the community; nature and scope of practices needed; practicality of community action. *Prereq. 16.575 or equiv.*

16.577 Environmental Conservation I (2 q.h.)
Identification of the natural resources of the land; history of the discovery and use of natural land resources; the scientific, social, and political uses of natural resources. *Prereq. 16.573 or equiv.*

16.578 Environmental Conservation II (2 q.h.)
The physical, chemical, and biological significance of the atmosphere; factors that are removed, added, or altered; the economic practices of the urban, suburban, and rural communities; modern methods of detection of atmospheric pollutants; modern techniques and practices designed to deal with the problem. *Prereq. 16.577 or equiv.*

16.579 Environmental Conservation III (2 q.h.)
An in-depth analysis of the natural resources of the ocean; reclamation of soil; detection and procurement of mineral resources—especially metals and fuel materials; chemical and thermal pollution problems; the biotic resources and their conservation. *Prereq. 16.578 or equiv.*

16.580 Economic Geography I (2 q.h.)
Theoretical approach and case study examination of spatial manifestations of the economy; spatial models and systems; the economic landscape. *Prereq. 16.563 or equiv.*

16.581 Economic Geography II (2 q.h.)
Continuation of 16.580—the locational determinants of services, trade, finance, and insurance; transportation and communications; manufacturing, construction, and the extractive industries. *Prereq. 16.580 or equiv.*

16.582 Applied Climatology (2 q.h.)
Climatic effects on man—his agricultural and economic activities; macroclimatology and microclimatology in rural, suburban, and urban situations; short- and long-range extremes and their climatological consequences. *Prereq. 16.581 or equiv.*

18—BIOLOGY

Consultant: Prof. F. D. Crisley, Chairman, Biology Dept. (L.A. College)
Course Coordinator: Prof. F. A. Rosenberg (L.A. College)

18.507 Gross Anatomy and General Physiology I (2 cl., 2 q.h.)
Fundamental concepts of living organisms; chemical and biological characteristics of cellular metabolism. The skeletal system and its appendages. General nomenclature, anatomical names and terms. *Perereq. none.*

18.508 Gross Anatomy and General Physiology II (2 cl., 2 q.h.)
The systems of the body and the relationships between them. The structure and function of each. *Prereq. 18.507 or equiv.*

18.509 Gross Anatomy and General Physiology III (2 cl., 2 q.h.)
Continuation of the systems of the body and the relationships between them. *Prereq. 18.508 or equiv.*

18.511 Biology I (General) (3 cl., 3 lab., 4 q.h.)
Universal properties and processes of living organisms; cellular composition and cellular activities; inheritance and cellular control. *Prereq. none.* (Laboratory fee)

18.512 Biology II (Animal) (3 cl., 3 lab., 4 q.h.)
Functional anatomy of animal organ systems, their interactions and environmental relationships. *Prereq. 18.511 or equiv.* (Laboratory fee)

18.513 Biology III (Animal) (3 cl., 3 lab., 4 q.h.)
Systematic comparative study of the structure and functions of animals. Diversity of animals considered from the standpoint of evolutionary adaptation. *Prereq. 18.512 or equiv.* (Laboratory fee)

18.519 Plant Biology (3 cl., 3 lab., 4 q.h.)
Systematic study of the structure and function of plants, principally vascular plants. Survey of the plant-like protists and monerans. *Prereq. 18.511 or equiv.* (Laboratory fee)

18.520 Medical Microbiology (2 cl., 4 lab., 4 q.h.)
Major characteristics of disease-producing organisms. *Prereq. A formal course or professional laboratory experience in bacteriology.* (Laboratory fee)

18.521 Microbiology I (2 cl., 4 lab., 4 q.h.)
Morphology and biochemistry of the bacteria. *Prereq. 18.513 or equiv.* (Laboratory fee)

18.522 Microbiology II (2 cl., 4 lab., 4 q.h.)
Survey of pathogenic microorganisms. *Prereq. 18.521 or equiv.* (Laboratory fee)

18.523 Microbiology III (2 cl., 4 lab., 4 q.h.)
Biology of the protista; the role of microorganisms in the environment and industry. *Prereq. 18.522 or equiv.* (Laboratory fee)

18.524 Human Anatomy and Physiology I (2 cl., 2 lab., 3 q.h.)
Introduction to human anatomy; osteology; anatomy of the muscular system, respiratory system, digestive system, the vascular system, urogenital system. The laboratory includes a study of human bone and cat dissection. *Prereq. 18.506 or 18.513 or equiv.* (Laboratory fee)

18.525 Human Anatomy and Physiology II (2 cl., 2 lab., 3 q.h.)
Principles of physiology and continuation of the study of human anatomy. The laboratory is mainly concerned with muscle physiology. *Prereq. 18.524 or equiv.* (Laboratory fee)

18.526 Human Anatomy and Physiology III (2 cl., 2 lab., 3 q.h.)
Continuation of the principles of physiology. The anatomy and physiology of the nervous system, physiology of the endocrine system. The laboratory deals with physiology of respiration and the physiology of blood. *Prereq. 18.525 or equiv.* (Laboratory fee)

18.530 Horticulture (3 q.h.)
The study of the science and art of plants, stressing the use of plants in the home and community. *Prereq. none.* (Laboratory fee)

18.531 Cell Biology I (2 cl., 2 q.h.)
Chemical composition of cells, structure of cells and organelles, transport processes, cell motion and excitability, growth. *Prereq. 18.513, 18.556, 18.558, and 12.533 or equiv.*

18.532 Cell Biology II (2 cl., 2 q.h.)
Cellular energy supply, enzyme function, respiration and metabolism, photosynthesis and other synthetic pathways, control of cellular process. *Prereq. 18.531 or equiv.*

18.533 Cell Biology III (4 lab., 2 q.h.)
Laboratory techniques in cell biology; microscopy; structure and chemical composition of cells; enzyme measurements; photosynthesis; respiration; active transport; growth. *Prereq. 18.532 or equiv.* (Laboratory fee)

18.535 Advanced Horticulture (3 q.h.)
The advanced study of the art and science of using plants for home and community. Special emphasis will be accorded various philosophies involving plants and man. *Prereq. 18.530.* (Laboratory fee)

18.538 Immunology (2 cl., 4 lab., 4 q.h.)
Biological, chemical, and physical attributes of antigens and antibodies, together with their serological interactions. *Prereq. 18.523, 12.533, or equiv.* (Laboratory fee)

18.551 Histology-Organology I (1 cl., 2 lab., 2 q.h.)
The morphology of cells and tissues. *Prereq. 18.513 or equiv.* (Laboratory fee)

18.552 Histology-Organology II (1 cl., 2 lab., 2 q.h.)
The tissue components of the integumentary, digestive, and respiratory systems. *Prereq. 18.551 or equiv.* (Laboratory fee)

18.553 Histology-Organology III (1 cl., 2 lab., 2 q.h.)
The tissue components of the cardiovascular, excretory, reproductive, and endocrine systems. *Prereq. 18.552 or equiv.* (Laboratory fee)

18.556 Genetics Laboratory (4 lab., 2 q.h.)
Laboratory exercises involving Principles of Mendelian inheritance, linkage, crossing-over. Classical genetics utilizing *Drosophila;* biochemical studies utilizing *Neurospora. Prereq. 18.558 or equiv.* (Laboratory fee)

18.557 Genetics I (2 cl., 2 q.h.)
Mitrosis, meiosis, and mendelian genetics. *Prereq. 18.513 or equiv.*

18.558 Genetics II (2 cl., 2 q.h.)
Chromosome mapping, mutations, translocation, chromosomal aberrations. *Prereq. 18.557 or equiv.*

18.561 Ecology I (2 cl., 2 q.h.)
Environmental factors. The soil system. Water. The atmosphere. Temperature, light, wind, pressure. The physico-chemical factors — CO_2, N and mineral nutrients. Habitat. Distribution of plants and animals in the world according to temperature and precipitation. *Prereq. 18.513 or equiv.*

18.562 Ecology II (2 cl., 2 q.h.)
The ecosystem. Ecological niche. The producers, consumers, and decomposers. The pond ecosystem, desert ecosystem, forest ecosystem, and seashore ecosystem. Energy cycle and efficiency of energy utilization. Mass, weight, and energy pyramids. *Prereq. 18.561 or equiv.*

18.563 Ecology III (2 cl., 2 q.h.)
Population ecology. Biotic community. Population growth. Relations between the species. Symbiosis. Competition. Predation. Succession. *Prereq. 18.562 or equiv.*

18.564 Man and His Biosphere I (2 cl., 2 q.h.)
An ecological analysis of the human situation and man's interaction with other organisms. The necessary foundation of biological principles will be presented.

18.565 Man and His Biosphere II (2 cl., 2 q.h.)
A continuation of Man and His Biosphere I. *Prereq. 18.564 or equiv.*

19—PSYCHOLOGY

Consultant: Prof. H. S. Zamansky, Psychology Dept. (L.A. College)
Associate Consultant: Prof. Harlan Lane, Chairman; Psychology Dept. (L.A. College)

19.501 Psychology I (2 q.h.)
An introductory survey of the historical backgrounds of psychology, psychological measurement and testing, and principles of animal and human learning.

19.502 Psychology II (2 q.h.)
Principles of sensory processing, perception, motivation and emotion, and social influences on behavior. *Prereq. 19.501 or equiv.*

19.503 Psychology III (2 q.h.)
Personality theory and measurement, behavior disorders, mental health, and psychotherapy. *Prereq. 19.502 or equiv.*

19.504 Statistics in Psychology I (2 q.h.)
Scales of measurement in psychological research, measures of central tendency, and variability. *Prereq. 19.503 or equiv.*

19.505 Statistics in Psychology II (2 q.h.)
Measures of correlation, introduction to probability, and statistical distributions. *Prereq. 19.504 or equiv.*

19.506 Statistics in Psychology III (2 q.h.)
Parametric and non parametric tests of significance, including chi square, t-test, F test, and simple analysis of variance. *Prereq. 19.505.*

Note: 19.504, 19.505, and 19.506 may not be taken in addition to Statistics (39.511, 39.512, 39.513). Psychology majors may substitute 39.511, 39.512, and 39.513 with permission of the Dean.

19.507 Psychology (Intensive) (6 q.h.)
An introductory survey of the historical backgrounds of psychology, psychological measurements and testing, and principles of animal and human learning. Principles of sensory processing, perception, motivation and emotion, and social influences on behavior. Personality theory and measurement, behavior disorders, mental health, and psychotherapy. *(Not open to students who have taken 19.501, 19.502, 19.503.)*

19.508 Fundamentals of Psychology I (4. q.h.)
Basic concepts from most areas of psychological investigation; the experimental orientation to the study of behavior, including child development, individual differences, learning, and social psychology. (Recommended for psychology majors.) *(Not open to students who have credit for 19.501, 502, 503.)*

19.509 Fundamentals of Psychology II (4. q.h.)
The sensory basis of behavior, cognition, perception, motivation, emotions, normal and abnormal personality. (Recommended for psychology majors.) *Prereq. 19.508 or equiv. (Not open to students who have credit for 19.501, 502, 503.)*

19.511 Developmental Psychology I (formerly Child Psychology I) (2 q.h.)
The behavioral examination of developmental abnormalities, as evidenced in mental retardation, childhood schizophrenia, child delinquency, hyperactivity, specific learning problems, and aging, is used to illuminate normal developmental processes. *Prereq. 19.509, 19.519, 19.503, or equiv.)*
(It is highly recommended that 19.540 be completed prior to registration for this course.)

19.512 Developmental Psychology II (formerly Child Psychology II) (2 q.h.)
Genetic factors in development; biological, social, and intellectual development during preschool years; factors in psychological development during the middle-childhood years; psychological and physical changes during adolescence; attitudes toward peer groups and parental figures; vocational choice; and the determination of moral standards and values. *Prereq. 19.511 or equiv.*

19.513 Developmental Psychology III (formerly Adolescent Psychology) (2 q.h.)
A continuation of 19.512. *Prereq. 19.512 or equiv.*

19.514 Personality I (2 q.h.)
A systematic study of the normal personality, its growth, and development. Topics include: environmental and constitutional contributions; assessment of personality; research; and a survey of the major theories of personality. (NOT open to students who have taken 19.521.) *Prereq. 19.509, 19.519 OR 19.503 or equiv.*

19.515 Personality II (Laboratory) (2 q.h.)
Introduction to methods and areas of research in personality. Includes problems of measurement, behavioral and dynamic concepts, and a laboratory project. *Prereq. 19.514 or equiv.*

19.518 Foundations of Psychology I (4 q.h.)
The basic principles of psychological analysis are taught by a personalized interaction method using videotapes, progress quizzes, one-to-one study tutorials, and optional small group discussions. The student can study at his/her own pace, within flexible calendar limits, and class hours are not preassigned.

19.519 Foundations of Psychology II (4 q.h.)
The personalized method of 19.518 is extended, featuring a sequence of graded reading assignments and tutorial sessions, with frequent self-evaluation of study progress. Topics include: the analysis of behavior as applied to education; personality and behavior disorders; brain damage and language; sensory processes; ethology, and aggression. *Prereq. 19.518 or equiv.*

19.523 Motivation (2 q.h.)
Survey of the various aspects of motivation. Such areas as primary and secondary reinforcement, unconscious motivation, effectance motivation, and the assessment of motive will be considered. *Prereq. 19.522 or equiv.*

19.524 Social Psychology I (2 q.h.)
The socialization process, social motives, interpersonal perception, group membership and structure. *Prereq. 19.503 or equiv.*

19.525 Social Psychology II (2 q.h.)
Attitudes, prejudice and ethnic relations, leadership, mass behavior and social movements, and the effects of mass media of communication. *Prereq. 19.524 or equiv.*

19.532 Industrial Psychology I (2 q.h.)
Psychology as applied to industry, including such topics as history causation of behavior, attitudes, morale, and supervision. *Prereq. 19.503 or equiv.*

19.533 Industrial Psychology II (2 q.h.)
The place of psychological tests in industry, individual differences, leadership, training, design of jobs, and practical application of these topics for the student in industry. *Prereq. 19.532 or equiv.*

19.534 Industrial Psychology III (2 q.h.)
Topics studied include motivation, fatigue, safety, and job turnover as related to industry. Special emphasis given to industrial mental health, counseling, interviewing, and personnel selection. *Prereq. 19.533 or equiv.*

19.536 Psychology of Thought (2 q.h.)
Psychological factors in intuition, imagination, problem-solving, information processing, and concept learning. *Prereq. 19.503 or equiv.*

19.537 Psychology of Language (2 q.h.)
The child's acquisition of language, verbal habits, the analysis and measurement of meaning, cultural determinants of linguistic behavior, communication processes, and recent research in psycholinguistics. *Prereq. 19.503 or equiv.*

19.538 Psychology of Learning I (2 q.h.)
Features the application of basic behavioral principles to behavioral development, behavior modification, language development, and programmed learning, and their relations to theoretical considerations in the learning process. *Prereq. 19.503 or equiv.*

19.540 Psychology of Learning II (Laboratory) (2 q.h.)
Through direct experience, students gain proficiency in the laboratory analysis of behavior, and in evaluating common generalizations about human behavior. Students design and perform experiments in animal and human learning, memory, decision processes, concept formation, and other topics of individual interest. *Prereq. 19.538 or equiv.*

19.541 Abnormal Psychology I (2 q.h.)
An introduction of the study of the etiology and dynamics of the abnormal personality. *Prereq. 19.503 or equiv.*

19.542 Abnormal Psychology II (2 q.h.)
The symptomatology and treatment of the neuroses and psychoses. *Prereq. 19.541 or equiv.*

19.543 Abnormal Psychology III (2 q.h.)
Psychosomatic, psychopathic, and organic disorders; varieties of psychotherapy. *Prereq. 19.542 or equiv.*

19.544 Abnormal Psychology (Intensive) (6 q.h.)
Same as 19.541, 19.542 and 19.543. *Prereq. 19.503 or equiv.*

19.545 Psychological Therapies (2 q.h.)
A survey of techniques for treating deviant behavior, from classical psychonalytical therapies through methods of behavior modification. *Prereq. 19.543 or equiv.*

19.549 Sensation and Perception I (2 q.h.)
An introduction to the nature of the perceptual world; the nature of object recognition and identification; spatial organization; contextual effects; learning and perception; and the influence of attitudinal, motivational, and personality factors on perception. *Prereq. 19.503 or equiv.*

19.550 Sensation and Perception II (Laboratory) (2 q.h.)
Students do laboratory experiments on seeing, hearing, touching, and tasting. Studies may include dark adaptation, loudness, binaural interaction, brightness constancy, two-point touch thresholds, information processing, and interactions between the senses. *Prereq. 19.549 or equiv.*

19.560 Psychology of Women (2 q.h.)
The examination, in both historical and contemporary context, the body of knowledge studying woman, her function in social roles, and her behavior as determined genetically, physiologically, and psychologically. The research implications, future life styles, roles, and contributions of women.

19.561 Scientific Foundations of Psychology I (formerly Historical Development of Psychology I) (2 q.h.)
Historical development of psychology from its philosophical beginnings. *Prereq. Two of the following: 19.515, 19.539, 19.550, 19.581.*

19.562 Scientific Foundations of Psychology II (formerly Historical Development of Psychology II) (2 q.h.)
Major schools of psychology which have influenced modern psychological research, including functionalism, behaviorism, Gestalt psychology, and psychoanalysis. *Prereq. 19.561 or equiv.*

19.571 Senior Seminar in Psychology (2 q.h.)
Small groups of students meet to discuss topics in psychology of mutual interest. Each seminar has a different flavor, depending upon the student group and faculty. *Prereq. 19.562 or equiv.*

19.580 Physiological Psychology I (2 q.h.)
How nerves function and work together in the nervous system; how our sense organs provide the brain with information about the outside world; how the

brain acts to produce external observable behavior; and how such psychological concepts as perception, learning, motivation arousal, and emotion may relate to nervous system activity. *Prereq. 19.509, 19.519 or 19.503, or equiv.*

19.581 Physiological Psychology II (Laboratory) (2 q.h.)
Laboratory experiments based on evolution of the nervous system, sensory and motor mechanisms, motivation and emotion, sleep, attention and perception, learning, and memory. *Prereq. 19.580 or equiv.*

19.588 Drugs and Behavior (2 q.h.)
The application of quantitative behavior techniques in animals and man, to determine the behavioral effects of pharmacological agents. A systematic survey of the experimental literature. *Prereq. 19.503 or equiv.*

19.589 Impact of Psychology on Society (2 q.h.)
A consideration of such recent developments as the uses of intelligence and aptitude tests; psychosurgery and electroconvulsive therapy; techniques of behavior modification and control; minority and women's rights movements; direct brain stimulation by implanted electrodes; use of psychoactive drugs; use of the lie detector machine; and the application of experimental techniques to humans. *Prereq. 19.503 or equiv.*

19.591 Honors Program I (4 q.h.)
Prereq. approval of the Dean.

19.592 Honors Program II (4 q.h.)
Prereq. 19.591.

19.593 Honors Program III (4 q.h.)
Prereq. 19.592.

19.699 Field Work in Psychology (6 q.h.)
Refer to page 87 describing field work courses (To be discussed with Department Consultant or Major Advisor prior to registration.)

20—ANTHROPOLOGY

Consultant: (See Sociology)

20.501 Anthropology I (formerly Introduction to Physical Anthropology) (2 q.h.)
An introduction to elements of physical anthropology, covering such subjects as the primates, fossil man and evolution, problems of heredity and genetics, problems of race and racial classification, and the bases of cultural behavior.

20.502 Anthropolgy II (formerly Cultural Anthropology I) (2 q.h.)
An introduction to cultural anthropology covering the nature of culture; methods and theories. *Prereq. 20.501 or equiv.*

20.503 Anthropology III (formerly Cultural Anthropology II) (2 q.h.)
Characteristic features of the language, family life, rituals, and values of tribal peoples in different parts of the world. *Prereq. 20.502 or equiv.*

20.504 Anthropology (Intensive)
Same as 20.501, 502, plus 503.

20.521 Culture and Personality (2 q.h.)
A cultural approach integrating concepts of social role, values, personality and socialization, and linguistic considerations. *Prereq. 20.503 or equiv.*

20.531 Primitive Social Organization (2 q.h.)
The institutions of primitive societies; comparative approaches and functional explanations of a limited number of societies; the dynamics of continuity and change of culture and social organization. *Prereq. 20.503 or equiv.*

20.532 Primitive Religion (2 q.h.)
A study of religious beliefs and rituals of tribal peoples in many parts of the world, including the origin of religious behavior, the relationship of religious behavior to other aspects of culture, and the psychological factors involved. *Prereq. 20.503 or equiv.*

20.533 Acculturation (2 q.h.)
An examination of the processes of acculturation in culture contact situations of tribal and non-tribal peoples. Focus is on the role of the individual, and the concepts of personality and values in relation to this process. *Prereq. 20.503 or equiv.*

20.537 Anthropological Theory (2 q.h.)
A history of major orientations, emphasizing the principal contemporary orientations in the field. Evolutionary approaches, culture area and historical analysis, functionalism, role structure, comparative methods, social relations approaches, and the theory of cognitive structure. *Prereq. 20.503 or equiv.*

20.541 North American Indian (2 q.h.)
Prehistory of the North American Indian, including the study of aboriginal culture areas, utilizing a comparative analysis of representative Indian tribes and their cultures as the method of study. Family life, religion, warfare patterns, and political organization are described. *Prereq. 20.503 or equiv.*

20.544 African Peoples and Cultures (2 q.h.)
African geography, prehistory, and cultures; the spectrum of cultures ranging from the Pygmy to Ashanti Federation; the family, lineage, clan, and tribe as these relate to problems of political and economic change in contemporary Africa. *Prereq. 20.503 or equiv.*

20.547 Latin American Peoples and Cultures (2 q.h.)
Tribal and peasant systems, traditional values, and institutions of Latin America, with particular emphasis on Hispanic America. *Prereq. 20.503 or equiv.*

20.548 Studying the Family Cross-Culturally (2 q.h.)
Family systems in a variety of cultural settings: Todas, the Hopi, the Anglo-Saxon, Kibbutz, etc.

20.549 Folklore (2 q.h.)
The general nature of folklore and methods employed in its study with emphasis on the behavioral-structural approach.

20.550 Peasant Society and Culture (2 q.h.)
The development of the concept of peasantry. Analyses of representative case studies of traditional peasant societies in the non-Western and Western world. *Prereq. 20.503 or 20.602 or equiv.*

20.551 Changing Peasantries (2 q.h.)
Peasant societies of Asia, Europe, Africa, and Latin America; historical traditions and social structure; change and modernization. *Prereq. 20.503 or 20.602 or equiv.*

20.552 Eastern European Peasantry in the Modern World (2 q.h.)
Selected studies of peasant societies in East-Central and Southeastern Europe from Russia to Greece. The traditional peasant village, collectivized peasant units. Programs of modernization under socialism and capitalism. *Prereq. 20.503 or 20.602 or equiv.*

20.560 Language and Culture (2 q.h.)
The function of language in human society and an introduction to the relationship between the patterns of language and the patterns of culture.

20.601 Principles of Anthropology I (4 q.h.)
An intensive introduction to elements of physical anthropology covering such subjects as the primates, fossil man and evolution, problems of heredity and genetics, problems of race and racial classification, the bases of cultural behavior, and the nature of culture.

20.602 Principles of Anthropology II (4 q.h.)
An intensive introduction to cultural anthropology covering characteristic features of tribal peoples, language, family life, rituals, values, social organization, etc. *Prereq. 20.601 or equiv.*

20.699 Field Work in Anthropology (6 q.h.)
(Refer to page 87 describing field work courses.)
To be arranged with a departmental field work adviser prior to registration. *Prereq. Major in Sociology-Anthropology and completion of 12 credits in Anthropology.* (Students may receive credit for only one departmental field work course. Credit for 20.699 precludes credit for 21.699).

21—SOCIOLOGY

Consultant: Prof. Lila Leibowitz, Sociology Dept. (L.A. College)
Coordinator: Prof. M. Golden, Sociology Dept. (L.A. College)

21.501 Sociology I (2 q.h.)
Basic concepts and theories relating to the study of man as a participant in group life with emphasis on social structure, culture, socialization, and the family.

21.502 Sociology II (2 q.h.)
A continuation of Sociology I with major emphasis on primary groups, associations, social stratification, collective behavior, and population. *Prereq. 21.501 or equiv.*

21.503 Sociology III (2 q.h.)
A continuation of Sociology II emphasizing a critical analysis of American society with particular attention to problems of social, political, urban, and industrial change. *Prereq. 21.502 or equiv.*

21.504 Sociology (Intensive) (6. q.h.)
Basic concepts and theories relating to the study of man as a participant in group life with emphasis on social structure, culture, socialization, and the family. Primary groups, associations, social stratification, collective behavior, and population. The major institutional areas, with particular attention to problems of social, political, urban, and industrial change. (*Not open to students who have taken 21.501, 21.502, 21.503). Prereq. 30.506.*

21.505 Drugs and Society (2 q.h.)
An introduction to the sociology of drugs. Examines social definitions of drugs, conditions of their use, and socialization into drug use. Considers deviant drug use and effects of social control on definitions and use. A range of licit and illicit drugs will be considered but major emphasis will be given to alcohol, marihuana, and heroin.

21.506 Sociology of Religion (2 q.h.)
An examination of the role of religious belief systems and institutions in various societies, ancient and modern, Western and non-Western.

21.507 Sex in Society: The Study of Sex Roles (2 q.h.)
Analysis of historical and contemporary development in how men's and women's changing roles are related to the society-at-large.

21.508 Sociology of Literature (2 q.h.)
A novel approach to novels and other literary productions from lyrics and love songs to sci-fi and films. Sociological analysis of content and contexts.

21.509 Sociology of Socialist Societies (2 q.h.)
Comparative sociology of China, USSR, Cuba, others, focussing on ideology, social organization, economy, polity, education, child care, women's positions, etc. The course will emphasize processes of change and the interrelationships between institutions.

21.512 Social Research Methods I (2 q.h.)
An introduction to social research methods with particular attention to problems of theory and method in both anthropology and sociology. *Prereq. Consent of the Instructor or 12 q.h. in sociology-anthropology.*

21.513 Social Research Methods II (2 q.h.)
A continuation of Social Research Methods I with emphasis on data collection, measurement, and scaling in both anthropology and sociology. *Prereq. 21.512 or equiv.*

21.514 Social Research Methods III (2 q.h.)
A continuation of Social Research Methods II stressing the analysis of data *Prereq. 21.513 or equiv.*

21.517 Social Theory I (formerly Foundations of Sociological Theory) (2 q.h.)
An historical survey of sociological theorists including the work of de Tocqueville, Comte, Marx, Durkheim, Cooley, and others. *Prereq. Consent of the Instructor or 12 q.h. in sociology-anthropology.*

21.518 Social Theory II (formerly Contemporary Sociological Theory I) (2 q.h.)
A study of major theoretical issues in sociology. Discussion concentrates on systematic questions and topics, as opposed to particular theorists, but material is drawn from theorists such as Weber, Simmel, Thomas, Mannheim, Merton, and Parsons. *Prereq. 21.517 or equiv.*

21:519 Social Theory III (formerly Contemporary Sociological Theory II) (2 q.h.)
A seminar in which the principal focus will be upon questions of theoretical interest, e.g., the problem of order, the problem of change, the role of the individual in change. Students will present their papers in class. *Prereq. 21.518 or equiv.*

21.528 Social Stratification: Class, Status, and Power (2 q.h.)
A comparative study of the nature of class structure with emphasis on the United States and with reference to India and England. Discussion of such topics as theories of class structure, factors determining class membership, differential class behavior, and social mobility. *Prereq. 21.503 or equiv.*

21.531 Social Change (2 q.h.)
An analysis of the changing patterns in social and economic institutions, a discussion of modern social trends, and a review of current literature in a field. *Prereq. 21.503 or equiv.*

21.534 Social Control (2 q.h.)
The study of group membership as a determinant of behavior, analysis of status and role, patterns of authority, and group ideology as factors in the evaluation of conduct. *Prereq. 21.503 or equiv.*

21.535 Political Sociology: Who Gets What (2 q.h.)
The social structure of political life emphasizing relationships in the structure of society with its classes, occupations, races, and levels of opportunity as they affect political activity. *Prereq. 21.503 or equiv.*

21.538 (see 25.538).

21.539 (see 25.539).

21.540 (see 25.540).

21.543 (see 25.543).

21.544 (see 25.544).

21.545 (see 25.545).

21.546 Sociology of Deviant Behavior (2 q.h.)
Analysis of the variety of social problems and their relationship to the organization of society. Particular attention will be given to alcoholism, sex offenses, drug abuse, mental health, and other problems relating to an urban industrial society. *Prereq. 21.503 or equiv.*

21.547 Social Problems (2 q.h.)
An overview of contemporary American social problems and the application of sociological concepts, methods, and principles to these problems. *Prereq. 21.503 or equiv.*

21.550 Juvenile Delinquency (2 q.h.)
A study of factors in delinquency and an examination of the implications for prevention, rehabilitation, and treatment. *Prereq. 21.503 or equiv.*

21.551 Family and Marriage I (2 q.h.)
A comparative and historical treatment stressing the past history and development of the family. *Prereq. 21.503 or equiv.*

21.552 Family and Marriage II (2 q.h.)
A continuation of Family and Marriage I emphasizing the backgrounds of contemporary problems in the context of functions, forms, and processes of this institution. *Prereq. 21.551 or equiv.*

21.553 Racial and Cultural Relations I (2 q.h.)
A study of the relationships between various racial, national, cultural, and religious groups with emphasis on the historical development of black-white relationships in American society. *Prereq. 21.503 or equiv.*

21.554 Racial and Cultural Relations II (2 q.h.)
A continuation of Racial and Cultural Relations I stressing the problems of contemporary black-white relationships in American and other societies. *Prereq. 21.553 or equiv.*

21.555 Racial and Cultural Relations III (2 q.h.)
A continuation of Racial and Cultural Relations II with specific attention to religious nationality, and non-African racial groups in American and other multiracial societies. *Prereq. 21.554 or equiv.*

21.556 Sociology of Poverty (2 q.h.)
An analysis of American poverty in historical perspective, drawing on comparisons with other countries. Critical evaluation of sociological research and theories relating to poverty. Consideration of causes and effects of poverty, as well as societal responses to poverty and its consequences. Suitable for students in applied fields, such as nursing, criminal justice, education, allied health, pre-med, and pre-law.

21.557 Urban Sociology (2 q.h.)
An analysis of the various causes, characteristics, and effects of urbanization in several different cultures of the world. Specific attention is given to the problems of urban and suburban living and the changing structure of the city. *Prereq. 21.503 or equiv.*

21.558 Community Analysis (2 q.h.)
Ecological theories of man's relation to his physical environment. Development of the concept, and discussion of community study methods. Contrasts between rural communities and urban neighborhoods. Discussion and evaluation of community-action programs. *Prereq. 21.503 or equiv.*

21.559 Seminar in Urban Studies (2 q.h.)
Interdisciplinary approaches to analyses of urban issues, continuing student projects. *Prereq. One previous course in urban studies field.*

21.560 Medical Sociology (2 q.h.)
Sociological concepts and research relating to the study of patterns of behavior in the areas of health and disease. Emphasis on the family, community, medical organizations, class, and status as social subsystems related to the field of health. *Prereq. 21.503 or equiv.*

21.561 Sociology of Mental Health
The emphasis of this course will be the sociological aspects of mental health and mental disorder. There will be presentations and discussions of the social history of mental illness, epidemiological and cross-cultural approaches to mental disorder, the career of the mental patient, the functions of psychiatry in society, community and social treatment modalities, and other aspects of social psychiatry. *Prereq. 21.503 or 21.602 or equiv.*

21.563 Social Gerontology: The Aged in Society (2 q.h.)
An examination of social factors involved in aging, with specific reference to how biological and psychological age change influence behavior, social roles, and cultural patterns. The relation of aging to social change, and special provisions for the aged. *Prereq. 21.503 or equiv.*

21.567 Population (2 q.h.)
The use of demographic methods in the analysis of social structures. Introduction to the use of population size and composition, birth rates, and other demographic data in the comparative analysis of societies. *Prereq. 21.503 or equiv.*

21.570 Sociology of Occupations and Professions (2 q.h.)
Analysis of the social relations within occupational groups, of occupational

structure, and of institutional aspects of an occupation. Relationships of supervisors, peers, colleagues, subordinates, and clientele; their significance for work role behavior. *Prereq. 21.503 or equiv.*

21.573 Sociology of Industry (2 q.h.)
Comparison of pre-industrial and industrial society, stressing the impact of industry on society and the relationship between industry, culture, and values. Diversification and specialization. Human relations in industry; analysis of subordinate—super ordinate behavior, line and staff relationships, and formal and informal groups. *Prereq. 21.503 or equiv.*

21.575 Sociology of Formal Organizations: Humans, Machines, and Bureaucracy (2 q.h.)
A study of formal organizations and the principles that govern organizational life. Weber's theory of bureaucracy and the concept of authority; communication systems and other conceptions of formal organizations. The structure of work groups and their effect on the larger organization. *Prereq. 21.503 or equiv.*

21.591 Honors Program I (4 q.h.)
Prereq. Approval of Dean.

21.592 Honors Program II (4 q.h.)
Prereq. 21.591.

21.593 Honors Program III (4 q.h.)
Prereq. 21.592.

21.601 Principles of Sociology I (Recommended for Majors) (4. q.h.)
An intensive introduction to basic concepts and theories relating to the study of man as a participant in group life. Emphasis is placed on socialization, culture, social structure, primary groups, family, social stratification, and population.

21.602 Principles of Sociology II (4 q.h.)
A continuation of Principles of Sociology I with emphasis on a critical analysis of American society with particular attention to problems of social, political, urban, and industrial change. *Prereq. 21.601 or equiv.*

21.612 Social Research Methods I (Intensive) (4 q.h.)
An intensive introduction to social research methods in both anthropology and sociology with particular attention to problems of theory, methods, and data collection. *Prereq. Consent of the Instructor or 12 q.h. in sociology-anthropology.*

21.613 Social Research Methods II (Intensive) (4 q.h.)
A continuation of Social Research Methods I (Intensive), with emphasis on data collection, measurement, scaling, and the analysis of data. *Prereq. 21.612.*

21.617 Social Theory I (Intensive) (4 q.h.)
An historical survey of sociology theorists, including the work of de Tocqueville, Comte, Mark, Durkheim, Cooley, Weber, Simmel, and others. *Prereq. Consent of the Instructor or 12 q.h. in sociology-anthropology.*

21.618 Social Theory II (Intensive) (4 q.h.)
A study of major theoretical issues in sociology. Discussion concentrates on systematic questions and topics, but material is drawn from theorists such as Mannheim, Merton, Parsons. Students will present papers in class on questions of theoretical interest; e.g., the problem of order, the problem of change, the role of the individual in change, etc.

21.699 Field Work in Sociology (6 q.h.)
(Refer to page 87 describing field work courses.)
To be arranged with a departmental field work adviser prior to registration. *Prereq. Major in Sociology-Anthropology and completion of Social Research Methods 21.514 or 21.613.* (Students may receive credit for only one departmental field work course. Credit for 21.699 precludes credit for 20.699).

25—SOCIAL WELFARE

Course Coordinator: Prof. Lois Ames (College of Criminal Justice)

25.538 Introduction to Social Welfare I (formerly 21.538)((2 q.h.)
An introduction to the nature and scope of the social welfare institution, its historical development, the effects of urban industrialization, and its relationship to present day American Society.

25.539 Introduction to Social Welfare II (formerly 21.539) (2 q.h.)
A continuation of Introduction to Social Welfare I, with particular attention to the development of social security and the welfare state.

25.540 Introduction to Social Welfare III (formerly 21.540) (2 q.h.)
A continuation of Introduction to Social Welfare II, focusing on selected aspects of the current social welfare system, its attempts to alleviate poverty, and other social problems.

25.543 Introduction to Social Work Practice I (formerly 21.543) (2 q.h.)
An introduction to the functions of the helping profession of social work, its settings and methods. Specific techniques such as interviewing, history taking, and recording skills are presented.

25.544 Introduction to Social Work Practice II (formerly 21.544) (2 q.h.)
A continuation of Introduction to Social Work Practice I, with particular attention to the functioning of social workers in selected settings.

25.545 Introduction to Social Work Practice III (formerly 21.545) (2 q.h.)
A continuation of Introduction to Social Work Practice II, with emphasis on enhancement of practice skills.

22—POLITICAL SCIENCE

Consultant: Prof. W. S. Jones, Chairman, Political Science Dept. (L.A. College)
Course Coordinator: Prof. Minton Goldman (L.A. College)

22.501 Principles of Political Science I (2 q.h.)
Evolution of the nation-state. Analysis of basic political concepts. Study of basic forms of the contemporary political system.

22.502 Principles of Political Science II (2 q.h.)
Analysis of constitutional and totalitarian models. Study of contemporary British and Soviet political systems. *Prereq. 22.501 or equiv.*

22.503 Principles of Political Science III (2 q.h.)
The American political system including study of civil rights. International politics and American foreign policy since 1945. *Prereq. 22.502 or equiv.*

22.505 Contemporary Political Theory (2 q.h.)
Political ideas and systems of political thought from Machiavelli to the present. *Prereq. 22.503 or equiv.*

22.506 American Political Thought (2 q.h.)
Political thought from the colonial period to the present including a study of the impact of religious, economic, and judicial theory on the structure of American ideas. *Prereq. 22.503 or equiv.*

22.507 Principles of Political Science (Intensive) (6 q.h.)
Evolution of the nation-state. Analysis of basic political concepts. Study of basic forms of the contemporary political system. Analysis of constitutional and totalitarian models. Study of contemporary British and Soviet political systems. The American political system including study of Civil Rights. International politics and American foreign policy since 1945. *(Not open to students who have taken 22.501, 22.502, 22.503, or equiv.)*

22.508 Research Methods (2 q.h.)
An introduction to some of the most common methods of carrying out research in the discipline of political science. Problems of theory construction, data-gathering, and a selection of analytical research tools including bibliographical aids and the computer are examined.

22.511 American National Government (2 q.h.)
A study of the form and structure of the federal constitution and an analysis of the legislative process at the national level. *Prereq. 22.503 or equiv.*

22.512 Urban and Metropolitan Government (2 q.h.)
The political, structural, and functional problems of an urbanizing United States, including an analysis of urban, suburban, and metropolitan governments. *Prereq. 22.503 or equiv.*

22.513 Political Parties and Pressure Groups (2 q.h.)
Party government in the United States and Great Britain. A contrasting study focusing on the interaction of party and government. *Prereq. 22.503 or equiv.*

22.514 American Constitutional Law (2 q.h.)
A case analysis of the development of federalism, the separation of powers, and the role of the federal and state courts in constitutional development.

22.515 Civil Rights (2 q.h.)
An evaluation of the quality and content of civil liberties in the United States. Emphasis will be placed on the first, fifth, sixth, fourteenth, and fifteenth amendments to The Constitution.

22.516 Public Administration I (2 q.h.)
An introduction to the theory, forms, and processes of administration at the national and state level.

22.517 Public Administration II (2 q.h.)
Selected problems. Case study approach to examination of relation between the theory and practice of public administration. *Prereq. 22.516 or equiv.*

22.518 Government and Politics of the States (2 q.h.)
A study of state and local government and problems and the function and operational responses to them.

22.519 The Legislative Process (2 q.h.)
An institutional, functional analysis of the roles of Congress, the executive, and political parties in the legislative process.

22.520 The American Presidency (2 q.h.)
A multifaceted examination of the nation's Chief Executive: the presidential electoral process; the President's many constituencies; and the differing styles of various 20th-century Presidents. The constitutional and extra-constitutional powers of the office are some areas considered.

22.521 Comparative Government I (2 q.h.)
A comparative analysis of political culture, organization, and behavior in England, France, and Germany. *Prereq. 22.503 or equiv.*

22.522 Comparative Government II (2 q.h.)
A continuation of 22.521. *Prereq. 22.521 or equiv.*

22.532 International Organization (2 q.h.)
Development of international organizations with special emphasis on the United Nations, specialized agencies, and regional organizations. *Prereq. 22.503 or equiv.*

22.533 American Foreign Policy (2 q.h.)
The constitution and political instruments for the formulation of American foreign policy. *Prereq. 22.503 or equiv.*

22.534 Soviet Foreign Policy (2 q.h.)
A study of the evolution of Soviet foreign policy since 1917 with emphasis on the development of the international Communist movement.

22.535 International Relations (4 q.h.)
Elements and limitations on national power. Contemporary world politics, problems of war and peaceful coexistence. *Prereq. 22.503 or equiv. (Not to be taken by students who have credit for 22.531.)*

22.536 Introduction to Political Theory (4 q.h.)
Development of the political ideas of the Western world. The major philosophers of Greece, Rome, The Christian Era, and the Renaissance. *Prereq. 22.503 or equiv. (Not to be taken by students who have credit for 22.504.)*

22.537 European Political Parties (2 q.h.)
A study of political party systems in England, France, and Germany emphasizing ideology, organization in and out of Parliament, electoral strategies, and voter behavior.

22.538 Communist China's Foreign Policy (2 q.h.)
A study of the Peking government's relations with Afro-Asia, the Soviet orbit, and the West. Attention is given to policy objectives, strategy, tactics, and the method of decision-making in both the party and state apparatus.

22.541 International Law (2 q.h.)
A procedural and substantive study of legal relations among nation states.

22.542 American Foreign Policy I (2 q.h.)
Recent and current American foreign affairs. *Prereq. 22.533 or equiv.*

22.543 American Foreign Policy II (2 q.h.)
Recent and current American foreign affairs, continued. *Prereq. 22.542 or equiv.*

22.544 Government and Politics in the Soviet Union I (2 q.h.)
An analysis of modern totalitarian theory and practice is followed by a study of the ideological and historical bases of the Soviet dictatorship. *Prereq. 22.522 or equiv.*

22.545 Government and Politics in the Soviet Union II (2 q.h.)
A continuation of 22.544. A study of the Soviet federalism, party and state organization, with special attention to the problems of political succession. *Prereq. 22.544 or equiv.*

22.547 Government and Politics of Communist China I (2 q.h.)
A study of Chinese political culture with emphasis on the nineteenth-century cultural, economic, and political impact of the West, the emergence of the Communist Party under the leadership of Mao, and the progressive disintegration of Kuomintang leadership. *Prereq. 22.522 or equiv.*

22.548 Government and Politics of Communist China II (2 q.h.)
A study of ideology, party, and state organization and behavior, and the Cultural Revolution. *Prereq. 22.547 or equiv.*

22.551 Current Political Issues (2 q.h.)
A topical analysis of the constitutional and political basis of selected problems in American political life.

22.552 Government and Politics in the Middle East (2 q.h.)
A study of political change, economic growth, and social adaptation in selected countries of the Middle East. Foreign policies are also considered, especially the ties of the Middle Eastern countries with Northern Africa. *Prereq. 22.522 or equiv.*

22.553 Government and Politics in the Middle East II (2 q.h.)
A continuation of 22.552. *Prereq. 22.552 or equiv.*

22.555 Government and Politics of Latin America I (2 q.h.)
After a discussion of the historical background of the Latin American nations an analysis of the cultural, economic, social, and political characteristics of these countries is undertaken. Political violence and the breakdown of democratic governments are given particular attention. *Prereq. 22.522 or equiv.*

22.556 Government and Politics of Latin American II (2 q.h.)
Analysis of politics of Mexico, Cuba, and Chile; the Communist, one-party, and democratic approaches to political development are compared; each of the three countries is used as an example. *Prereq. 22.555 or equiv.*

22.558 Government and Politics of South East Asia (2 q.h.)
A study of political instability and problems of establishing democratic structures and processes in the Philippines, Thailand, and India. *Prereq. 22.522 or equiv.*

22.559 Government and Politics of Japan (2 q.h.)
The historical development of the Japanese nation is studied with particular attention to the growth of fascism. Efforts to create a viable democracy since Wold War II is a major concern of the course. *Prereq. 22.522 or equiv.*

22.560 Politics and Policies of the Developing Nations I (2 q.h.)
Colonialism and the struggles for independence are discussed and the common problems of developing nations are analyzed. Topics include economic development, urbanization, cultural fragmentation, and revolution. *Prereq. 22.522 or equiv.*

22.561 Politics and Policies of the Developing Nations II (2 q.h.)
Based on the foundation provided in Part I, this course deals with efforts of developing countries to achieve rapid social, economic, and political modernization. The frequency of military takeovers and the prevalence of corrupt, inefficient government bureacracies are discussed. The democratic and authoritarian avenues toward development are compared and evaluated. *Prereq. 22.560 or equiv.*

22.562 Government and Politics of Sub Saharan Africa (2 q.h.)
Comparative analysis of political culture, organization, and behavior of African states south of the Sahara. *Prereq. 22.522 or equiv.*

22.563 Government and Politics of Northern Africa (2 q.h.)
Comparative analysis of political culture, organization, and behavior of African states north of the Sahara. Emphasis is on Morocco, Algeria, Tunisia, and Egypt. *Prereq. 22.522 or equiv.*

22.564 Communism in Eastern Europe I (2 q.h.)
A study of the conditions and circumstances surrounding the establishment of Communist regimes in Eastern Europe immediately after the Second World War, and their relations with Soviet Union. *Prereq. 22.522 or equiv.*

22.565 Communism in Eastern Europe II (2 q.h.)
A continuation of 22.564. A study of nationalism, popular revolt, and socio-economic change in the 1950's and 1960's. Attention is given to the changing role of the Soviet Union in bloc affairs and the development of polycentrism. *Prereq. 22.564 or equiv.*

22.570 Consumer Advocacy I (2 q.h.)
A pragmatic course designed to define and expand the role of consumers in the marketplace. It is intended to focus upon consumer issues which confront us daily, so that individuals may deal with them intelligently and effectively. While not designed to make students "consumer-lawyers," it will touch upon legal as well as social, economic, and political aspects of consumer problems.

22.571 Consumer Advocacy II (2 q.h.)
A continuation of 22.570. *Prereq. 22.570 or equiv.*

22.572 Consumer Advocacy III (2 q.h.)
A continuation of 22.571. *Prereq. 22.571 or equiv.*

22.591 Honors Program I (4 q.h.)
Prereq. Approval of the Dean.

22.592 Honors Program II (4 q.h.)
Prereq. 22.591.

22.593 Honors Program III (4 q.h.)
Prereq. 22.592.

22.601 Introduction to Political Science I (4 q.h.)
Basic political concepts and forces of organization from the classical Greeks to the modern nation-state. The Soviet Union and the United Kingdom are contrasted as contemporary illustrations of the institutional distinction between a totalitarian and constitutional system. *(Not open to students who intend to receive credit for 22.501, 22.502, 22.503.)*

22.602 Introduction to Political Science II (4 q.h.)
The development of operational liberty in the United States and its constitutional underpinnings are considered, together with an analysis of the national American political process and the conduct of recent American foreign relations. *(Not open to students who intend to receive credit for 22.501, 22.502, 22.503.)*

23—HISTORY

Consultant: R. H. Robinson, Chairman, History Dept. (L.A. College)

Coordinator of Western Civilization and Adviser to History Majors: G. H. Herman, History Dept. (L.A. College)

23.500 The Historian's Craft (4 q.h.)
The ways in which the historian studies the past with emphasis on research and writing.

23.501 Western Civilization I (2 q.h.)
The beginnings of Western Civilization, with emphasis on the political, economic, and social history of ancient and medieval times to 1300.

23.502 Western Civilization II (2 q.h.)
Early Modern Europe from 1300 to 1789, with an examination of the two major intellectual movements, the Renaissance and the Enlightenment, and their impact on the rise of national states, capitalism, and Protestantism.

23.503 Western Civilization III (2 q.h.)
Modern Europe from 1789 to the present, emphasizing the rise of ideology in a technological age.

23.504 American History I (2 q.h.)
America from 1763 to 1840, with emphasis on political institutions and policies of the new republic.

23.505 American History II (2 q.h.)
The United States from 1840 to 1900, with emphasis on the rise of the sectional controversy, the Civil War, and the economic development of the nation after the war.

23.506 American History III (2 q.h.)
The United States since 1900; an age of urbanized industrialism and international crisis.

23.509 Western Civilization A* (3 q.h.)
Western Civilization to 1648. *(Not open to students who intend to receive credit for 23.501 and/or 23.502.)*

23.510 Western Civilization B* (3 q.h.)
Western Civilization since 1648. *(Not open to students who intend to receive credit for 23.502 and/or 23.503.)*

23.511 American History A* (3 q.h.)
America from 1763 to 1877. *(Not open to students who intend to receive credit for 23.504 and/or 23.505.)*

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*The course sequence 23.509, 23.510 is identical to 23.501, 23.502 and 23.503.
The course sequence 23.511, 23.512 is identical to 23.504, 23.505 and 23.506.
The A and B sequence is accomplished in two quarters rather than three for the I, II, III sequence.

23.512 American History B* (3 q.h.)
The United States since 1877. *(Not open to students who intend to receive credit for 23.505 and/or 23.506.)*

23.515 Women in American History (2 q.h., Group III)
An historical examination of the position and role of women in American history.

23.516 Women in European History (2 q.h., Group II)
An historical examination of the position and role of women in European history.

23.520 Population in History (2 q.h., Group I or II)
An application of the principles of demography to European history, from Roman times to the present.

23.521 Ancient Middle East (2 q.h., Group I)
A study of ancient cultures and people in the Middle East, to the rise of Islam.

23.522 Ancient Greece (2 q.h., Group I)
The origin and development of Greek civilization.

23.523 Ancient Rome (2 q.h., Group I)
Roman civilization in ancient times, with emphasis on the rise of the Republic and the decline of the Empire.

23.524 Early Middle Ages (2 q.h., Group I)
Europe from the decline of the Roman Empire to 1050, with emphasis on barbarian migrations, the role of religion in medieval society, and the fashioning of political and economic institutions of feudalism and manorialism .

23.525 Late Middle Ages (2 q.h., Group I)
The medieval period from 1050 to 1350 with emphasis on the church-state controversy and the growth of classicism in the arts.

23.526 Early Modern Europe (2 q.h., Group I)
The political, economic, and social history of Europe from 1350 to 1648.

23.527 England, 500–1603 (2 q.h., Group I)
England, to the coming of the Stuarts.

23.530 Byzantine History (2 q.h., Group I)
A political and cultural history of the Eastern Christian world, from the fourth century to the sacking of Constantinople in 1453.

23.531 Islamic History (2 q.h., Group IV)
The history of the Muslim Arab world, from the seventh century to the end of the Abbasid Caliphate in 1258.

23.532 Ottoman History (2 q.h., Group IV)
A study of the rise, glory, decay, and attempts at reform in the Ottoman Empire from the thirteenth century to World War I.

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*The course sequence 23.509, 23.510 is identical to 23.501, 23.502 and 23.503.
The course sequence 23.511, 23.512 is identical to 23.504, 23.505 and 23.506.
The A and B sequence is accomplished in two quarters rather than three for the I, II, III sequence.

23.533 History of the Jews I (2 q.h., Group I)
A survey of the Jews from the end of antiquity to early modern times, from a cultural and intellectual perspective.

23.534 History of the Jews II (2 q.h., Group II)
The role and position of the Jew in modern history.

23.537 European Intellectual History, 1350–1688 (2 q.h., Group I)
The major ideas of the Renaissance and Reformation.

23.538 European Intellectual History, 1688–1815 (2 q.h., Group I)
The broad spectrum of eighteenth-century thought, with emphasis on scientific, religious, and political ideas.

23.539 European Intellectual History since 1815 (2 q.h., Group II)
The main currents of European thought considered in their social and political context, from Romanticism to the present.

23.541 Europe, 1648–1789 (2 q.h., Group I)
Europe from the end of the Thirty Years' War to the French Revolution.

23.542 Europe, 1789–1870 (2 q.h., Group II)
Europe from the French Revolution to the Franco-Prussian War, with a stress on the struggles for liberalism and nationalism.

23.543 Europe, 1870–1914 (2 q.h., Group II)
The background of World War I, with an emphasis on the roles of nationalism, militarism, imperialism, and the European alliance system.

23.544 Europe, 1914–1939 (2 q.h., Group II)
Europe from World War I to World War II, emphasizing the failures of peacemakers at Versailles and the subsequent rise of aggressive autocracies in Italy and Germany.

23.545 Europe since 1939 (2 q.h., Group II)
World War II and its aftermath, with an emphasis on the Cold War and attempts by European nations to unify the continent.

23.548 England, 1603–1815 (2 q.h., Group I)
England in the Stuart and Hanover age, with emphasis on the victory of the parliamentary institutions over the monarchy.

23.549 England since 1815 (2 q.h., Group II)
The democratization of English life in the nineteenth and twentieth centuries, with emphasis on changing imperial and international relations.

23.552 English Constitutional History to 1485 (2 q.h., Group I)
The development of the English constitution from Anglo-Saxon roots to the coming of the Tudors, with attention to local as well as central government.

23.553 English Constitutional History since 1485 (2 q.h., Group II)
The victory of Parliament over the King and the subsequent democratization of England's governmental institutions and processes.

.554 France since 1815 (2 q.h., Group II)
rance after Napoleon, with attention to continuing attempts by the French eople to find satisfactory political institutions.

.555 Germany since 1815 (2 q.h., Group II)
n analysis of the role of nationalism in German life after 1815, with emphasis n unification, militarism, and imperialism.

.556 Italy since 1815 (2 q.h., Group II)
ne unification of Italy, the attempt to establish constitutional monarchy, the se of fascism after World War I, and the movement toward democratic repub- canism after World War II.

.557 Ireland since 1800 (2 q.h., Group II)
study of the Irish question in British politics, from the Act of Union to the stablishment of the Free State.

.558 European Economy and Society to 1750 (4 q.h., Group I)
topical survey of European economic and social development in the pre- ndustrial period.

.559 European Economy and Society since 1750 (4 q.h., Group II)
topical survey of European economic and social development from the begin- ings of industrialization to the present.

.560 American Indians (2 q.h., Group III)
survey of the American Indian from pre-Columbian times to the present.

.561 Colonial America to 1689 (2 q.h., Group III)
he exploration and settlement of North America, with emphasis on the estab- shment of political, social, and economic institutions.

.562 Colonial America, 1689–1763 (2 q.h., Group III)
lorth America in an age of international rivalry for the continent.

.563 American Revolution and Constitution (2 q.h., Group III)
merica's quest for independence from England and the efforts to establish overnments in the new republic.

.564 American Constitutional History, 1789–1900 (2 q.h., Group III)
elected topics in the development of the American Constitution, with primary mphasis on federalism and the relations of government and the economy.

.565 American Constitutional History since 1900 (2 q.h., Group III)
opics include the conflict between the liberal and conservative attitudes toward he role of government in the economy and the role of the Supreme Court in ne struggle for civil liberties and rights.

.566 United States since 1945 (4 q.h., Group III)
he American people, from the close of World War II to the present.

23.567 American Diplomatic History (2 q.h., Group III)
Selected topics in the history of American foreign relations and policy since 1789.

23.568 American Social History (2 q.h., Group III)
Selected topics in the life of the American people since 1789.

23.569 American Economic History (2 q.h., Group III)
Selected topics in the development of the capitalist economy in America since 1789, with attention to the role of government.

23.571 American Urban History (2 q.h., Group III)
The development of urban society in the United States since 1800.

23.574 Afro-American History (2 q.h., Group III)
The history of Afro-Americans, from colonial times to the present.

23.575 Populism and Progressivism (2 q.h., Group III)
A topical history of the United States from 1877 to 1917, concentrating on its social and cultural reactions to the processes of industrialization and urbanization.

23.576 The United States, 1917–1933 (2 q.h., Group III)
A topical history of the United States in time of world war, prosperity, and depression.

23.577 The Age of Roosevelt (2 q.h., Group III)
America in the era of the Great Depression and World War II.

23.580 Perceptions of America (2 q.h., Group III)
A study of the image of America and Americans, as expressed by Americans and others.

23.581 Latin America to 1826 (2 q.h., Group IV)
The fusing of Indian, Iberian, and Negro cultures in Latin America and the quest for political independence.

23.582 Latin America, 1826–1920 (2 q.h., Group IV)
The attempts by Latin Americans to establish stable societies and democratic governments.

23.583 Contemporary Latin America (2 q.h., Group IV)
The struggles of Latin Americans for political, economic, and social development since 1920.

23.584 The Far East to 1850 (2 q.h., Group IV)
The history of China and Japan prior to their opening by the West in the mid-nineteenth century.

23.585 China since 1850 (2 q.h., Group IV)
A century of China's history, with emphasis on the western impact on Chinese

civilization, China's struggle to maintain independence, and the victory of communism in the twentieth century.

23.586 Japan since 1850 (2 q.h., Group IV)
An analysis of Japanese domestic developments and foreign relations since the mid-nineteenth century.

23.588 Africa to 1885 (2 q.h., Group IV)
African prehistory; the evolution of African government and society; the dynamics of Afro-European contact before 1885.

23.589 Africa since 1885 (2 q.h., Group IV)
The European impact on Africa; the rise of African nationalism; the emergence of independent African states.

23.591 Modern Middle East (2 q.h., Group IV)
The Middle East since 1914, with attention to Zionism, Pan Arabism, the effects of two world wars, and the postwar settlements.

23.592 India and Pakistan (2 q.h., Group IV)
The political and religious history of the peoples who formed India and Pakistan with an account of internal developments and foreign relations since independence.

23.593 Southeast Asia (4 q.h., Group IV)
The cultures of the peoples of Southeast Asia, with an examination of the impact of European nations upon them and an account of their quests for national identity and economic development.

23.594 Russia, 1450–1801 (2 q.h., Group I)
The emergence of Russia as a recognized European power with an account of westernization and expansion in the eighteenth century.

23.595 Russia, 1801–1917 (2 q.h., Group II)
The history of the Russian people and their government, from the Days of Czar Alexander I to the revolutions of 1917.

23.596 Russia since 1917 (2 q.h., Group II)
The revolutions of 1917 and the subsequent history of the Russian people and their government, with special emphasis on foreign relations.

23.597 Honors Program I (4 q.h.)
Prereq. Approval of Dean.

23.598 Honors Program II (4 q.h.)
Prereq. 23.597.

23.599 Honors Program III (4 q.h.)
Prereq. 23.598

23.601 Western Civilization IV (4 q.h.)
The major ideas and institutions of Western Civilization from ancient times to

1648. *(Not open to students who intend to receive credit for 23.501, 23.502, or 23.509.)*

23.602 Western Civilization V (4 q.h.)
A continuation of 23.601, covering the period since 1648. *(Not open to students who intend to receive credit for 23.502, 23.503, or 23.510.)*

23.699 Field Work in History (6 q.h.)
Extra-collegiate experience in historical research or historical agencies. (Refer to page 87 describing field work courses) *Pereq. Survey courses in Western Civilization and American History and 23.500.*

25—SOCIAL WELFARE (see page 190.)

26—PHILOSOPHY

Consultant: Prof. E. Hacker, Philosophy Dept. (L.A. College)

26.501 Introduction to Philosophy I (2 q.h.)
An examination of the aims, functions, and methods of philosophy by means of a systematic study of one or two philosophers. Questions in ethics and moral philosophy stressed in the latter part of the quarter.

26.502 Introduction to Philosophy II (2 q.h.)
Development of some of the major conceptions of the meaning of human existence, the nature of human knowledge, and the nature and existence of God.

26.503 Introduction to Philosophy III (2 q.h.)
A study of some of the central views of the aims, structure, and functions of society. One other area in philosophy will be discussed in the latter half of this quarter.

26.510 Introduction to Philosophy (Intensive) (6 q.h.)
An examination of the aims, functions, and methods of philosophy in comparison with other areas of human knowledge and valuation. Inquiry into the nature of morality, kinds of moral judgments, and types of ethical theories with particular attention to their application to moral issues of our day. Comparison of major conceptions of the ultimate meaning of human existence, the nature of mind, freedom, and God. *(Not open to students who have taken 26.501, 26.502, 26.503, or equiv.)*

26.504 The Greek and Roman Philosophers (2 q.h.)
Development of western thought from the seventh century B.C. until the time of Christ with emphasis upon Plato, Aristotle, and the Stoics.

26.505 The Ages of Belief and Adventure (2 q.h.)
The leading philosophers of the early Christian, Medieval, and Renaissance periods with particular attention to St. Augustine, St. Thomas, Francis Bacon, and Thomas Hobbes. *Prereq. 26.504 or equiv.*

26.506 The Ages of Reason and Enlightenment (2 q.h.)
Philosophy in the seventeenth and eighteenth centuries with emphasis upon Descartes, Spinoza, Locke, Hume, and Kant. *Prereq. 26.505 or equiv.*

26.507 Philosophy of the Nineteenth Century (2 q.h.)
Philosophic trends in the nineteenth century considered as background for the understanding of ideas influential in the twentieth century. *Prereq. 26.503, 26.506 or equiv.*

26.508 Twentieth-Century Philosophy (2 q.h.)
Discussion of the major contemporary philosophic trends as represented by logical positivism, analytic philosophy, and existentialism. *Prereq. 26.507 or equiv.*

26.509 Major Thinkers of Our Time (2 q.h.)
An in-depth study of two or three philosophers, representatives of which would be Austin, Ayer, Carnap, Dewey, Lewis, Maritain, Moore, Sartre, or Whitehead. *Prereq. 26.508 or equiv.*

26.511 Philosophy of Art I (2 q.h.)
The nature of art and the experience of beauty.

26.512 Philosophy of Art II (2 q.h.)
Theories concerning art and aesthetic experience such as those of Plato, Aristotle, Tolstoy, Santayana, Dewey, and Cassirer. *Prereq. 26.511 or equiv.*

26.513 Philosophy of Art III (2 q.h.)
A study of the problems of artistic taste, standards of criticism, and the objectivity of artistic judgements. Concludes with a discussion of the arts, the artist, and society. *Prereq. 26.512 or equiv.*

26.514 The Human Search for Meaning (2 q.h.)
The role of selected recent philosophy and literature in the human struggle for meaning and identity. Some of the themes to be explored: freedom and responsibility; alienation and anxiety; death and finitude.

26.515 Images of Man in Philosophy (2 q.h.)
An exploration of selected concepts of the nature of man in philosophy and literature.

26.516 Technology and Man (2 q.h.)
An exploration of the human issues which have arisen in a technological age. Issues such as the relations between man and machine and the moral issues surrounding organ transplants are representative.

26.517 Utopias and Anti-Utopias (2 q.h.)
A study of utopian and anti-utopian literature as expressions of social criticism and as theories of social reform.

26.521 Philosophy of Religion I (2 q.h.)
A study of the nature of religious experience and beliefs about the nature of God.

26.522 Philosophy of Religion II (2 q.h.)
The origins, nature, and functions of religion. *Prereq. 26.521 or equiv.*

26.523 Philosophy of Religion III (2 q.h.)
Intensive study of some of the major problems such as natural and moral evil, the soul, immortality, miracles, and religious knowledge. *Prereq. 26.522 or equiv.*

26.524 The Great Eastern Religions I (2 q.h.)
The development of eastern primitive religions and their subsequent evolution into the sophisticated forms of the contemporary eastern religions.

26.525 The Great Eastern Religions II (2 q.h.)
Study of Egyptian and Babylonian religions, Confucianism, and Taoism. *Prereq. 26.524 or equiv.*

26.526 The Great Eastern Religions III (2 q.h.)
Study of Hinduism, Buddhism, and Shintoism. *Prereq. 26.525 or equiv.*

26.527 The Great Western Religions I (2 q.h.)
The development of western primitive religions and their subsequent evolution into the sophisticated forms of the contemporary western religions.

26.528 The Great Western Religions II (2 q.h.)
Study of Zoroastrianism, Judaism, and Christianity. *Prereq. 26.527 or equiv.*

26.529 The Great Western Religions III (2 q.h.)
Study of the religion of Islam, contemporary religious sects, and religious phenomena. *Prereq. 26.528 or equiv.*

26.531 Ethics I (2 q.h.)
Introduction to moral problems such as egoism and altruism, good and evil, conscience, obligation, and human freedom.

26.532 Ethics II (2 q.h.)
Critical discussion of some of the major ethical theories and the implications of modern psychological and sociological theories about man and society. *Prereq. 26.531 or equiv.*

26.533 Ethics III (2 q.h.)
The relations of ethical theory and morality to religion, social philosophy, art, and science. *Prereq. 26.532 or equiv.*

26.534 Logic (2 q.h.)
Emphasis upon logic as a practical discipline which enables the student to analyze types of arguments and to detect fallacies in arguments.

26.535 Ethics (Intensive) (6 q.h.)
Same as 26.532, 533, and 534.

26.541 Social Philosophy I (2 q.h.)
Critical examination of the leading socio-political ideologies in regard to their conceptions of the character, structure, and function of society. Plato and Aristotle emphasized.

26.542 Social Philosophy II (2 q.h.)
Continuation of 26.541 with emphasis upon Hobbes, Locke, Hegel, and Mill. *Prereq. 26.541 or equiv.*

26.543 Social Philosophy III (2 q.h.)
Emphasis upon Marxism, contemporary communism, fascism, capitalism, and contemporary social ideologies. *Prereq. 26.542 or equiv.*

26.544 Selected Topics in Philosophy I (2 q.h.)
Advanced course. Readings chosen jointly by students and instructor. Has included such topics as aggression, utopian literature, Marxism, pragmatism.

26.545 Selected Topics in Philosophy II (2 q.h.)
Continuation of 26.544

26.546 Selected Topics in Philosophy III (2 q.h.)
Continuation of 26.545

26.551 The Existentialist Revolt (2 q.h.)
Sources of existentialism in the Western tradition with emphasis upon Kierkegaard and Nietzsche.

26.552 The Existentialist Challenge (2 q.h.)
The existential view of man and his world with emphasis upon Heidegger, Sartre, and the religious existentialists—Marcel, Tillich, and Buber. *Prereq. 26.551 or equiv.*

26.553 Existentialism Appraised (2 q.h.)
Contemporary assessments of the existentialism movement, its meaning, significance, and truth. *Prereq. 26.552 or equiv.*

26.560 Buddhism (2 q.h.)
The principal teachings of the Buddhists.

26.561 Hinduism (2 q.h.)
The major Hindu teachings.

26.562 Islam (2 q.h.)
The major principles of Islam.

26.563 Judaism (2 q.h.)
The elements of Judaism.

26.567 Mysticism: East and West (2 q.h.)
An exploration of mystical experiences through a discussion of some representative religious mystics.

26.570 Religion and Myth (2 q.h.)
A study of myths as the expressions of religious man's experience of the world and himself. Examples will be drawn from primitive religions and the traditional religious of East and West.

27—FINE ARTS

Consultant: Prof. R. L. Wells, Chairman, Art Dept. (L.A. College)

27.501 Introduction to the Arts (2 q.h.)
Introduction to the techniques and meanings of various artistic expressions in painting, sculpture, drawing, architecture, and graphic arts.

27.504 History of Art I (2 q.h.)
History of Western art from prehistoric times to the end of the Roman Empire.

27.505 History of Art II (2 q.h.)
History of Western art from the end of the Roman Empire to the late sixteenth century. *Prereq. 27.504.*

27.506 History of Art III (2 q.h.)
History of Western Art from the late sixteenth century to the twentieth century. *Prereq. 27.505.*

27.507 Ancient Architecture (2 q.h.)
Developments in the builder's art from prehistoric times to the end of the classical Era.

27.508 Medieval and Renaissance Architecture (2 q.h.)
A study of architecture from the Early Christian Period through the Renaissance.

27.509 European Architecture (2 q.h.)
Seventeenth-, eighteenth-, and nineteenth-century architecture.

27.510 Ancient Painting and Sculpture I (2 q.h.)
A survey of art from pre-historic period through Egypt and Mesopotamia.

27.511 Ancient Painting and Sculpture II (2 q.h.)
A survey of art from Crete through Greece and Rome.

27.512 Medieval Painting and Sculpture (2 q.h.)
Early Christian era; Byzantine, Romanesque, and Gothic Art.

27.514 European Painting (2 q.h.)
Development of painting from the late sixteenth century to the middle of the nineteenth century in Northern and Western Europe.

27.515 Modern Painting I (2 q.h.)
The development of painting from late nineteenth century to the Surrealist movement.

27.516 Modern Painting II (2 q.h.)
The various styles of painting from Surrealism to contemporary art.

27.518 Twentieth-Century American Architecture (2 q.h.)
Study of architecture from Richardson to the present.

27.519 Twentieth-Century European Architecture (2 q.h.)
Study of architecture from Le Corbusier to the present.

27.520 Italian Renaissance Art (2 q.h.)
Study of painting and sculpture of the fifteenth and sixteenth centuries.

27.522 French Painting (2 q.h.)
Study of French painting of the nineteenth century.

27.523 English Art (2 q.h.)
English art from the Gothic to the nineteenth century.

27.524 American Art I (2 q.h.)
The development of American architecture, sculpture, and painting from Colonial times to the War of Independence.

27.525 American Art II (2 q.h.)
The development of American architecture, sculpture, and painting from the Revolution to the Civil War. *Prereq. 27.524 or equiv.*

27.526 American Art III (2 q.h.)
The development of American architecture, sculpture, and painting from the Civil War to the present. *Prereq. 27.525 or equiv.*

27.527 Life Drawing I (3 q.h.)
Basic life drawing involving anatomy and study of figure drawing. *Prereq. 27.543 or other drawing courses on departmental approval.*

27.528 Life Drawing II (3 q.h.)
Life drawing of the figure in various media. *Prereq. 27.527.*

27.529 Life Drawing III (3 q.h.)
Figure drawing and figure composition in various media. *Prereq. 27.528.*

27.535 African Art (2 q.h.)
Various stylistic characteristics of sculpture and other artistic expressions of the major cultures of Africa from the thirteenth to the twentieth century.

27.536 Latin American Art (2 q.h.)
Pre-Columbian and post-Columbian art forms of Latin America, including architecture, sculpture, painting, and the decorative arts—excluding Mexico.

27.538 Chinese Painting (2 q.h.)
A history of the Chinese art of painting from its inception to the twentieth century.

27.539 Japanese Art (2 q.h.)
The arts of painting, sculpture, and architecture in Japan.

27.540 Freehand Drawing (3 q.h.)
An elementary course in drawing. *(Does not fulfill drawing requirement for the studio art major.)*

27.541 Drawing I (3 q.h.)
Practice in the techniques and development of drawing in pencil, pen, and ink, with concentration on basic drawing problems.

27.542 Drawing II (3 q.h.)
Practice in the techniques of wash drawing, scratch board drawing, and mixed medias. *Prereq. 27.541 or equiv.*

27.543 Drawing III (3 q.h.)
Study of human anatomy and the practice of figure drawing and composition. *Prereq. 27.542 or equiv.*

27.544 Graphic Arts I (3 q.h.)
Creative expression in various graphic art media such as woodcuts.

27.545 Graphic Arts II (3 q.h.)
Execution of prints in various media and the printing process.

27.546 Graphic Arts III (3 q.h.)
Execution of more advanced printmaking with various graphic media.

27.547 European Graphic Arts (2 q.h.)
History of graphic arts from the Medieval period to the end of the nineteenth century. Development of engraving, etching, woodcuts, and lithography.

27.551 Painting—Basic Level I (3 q.h.)
Practice and creative expression in the technical fundamentals of figure and landscape painting.

27.552 Painting—Basic Level II (3 q.h.)
Creative expression in advanced painting problems of figure study. *Prereq. 27.551 or equiv.*

27.553 Painting—Basic Level III (3 q.h.)
Creative expression in advanced painting problems in composition. *Prereq. 27.552 or equiv.*

27.554 Painting—Advanced Level I (3 q.h.)
Painting with concentration upon the development of personal expression and style.

27.555 Painting—Advanced Level II (3 q.h.)
Painting with concentration upon the development of personal style and the execution of various painting problems.

27.556 Painting—Advanced Level III (3 q.h.)
Development of style and experimentation with various media.

27.557 Advanced Graphic Arts I (3 q.h.)
Execution of advanced printmaking in various media. *Prereq. 27.544, 546, 547 or other graphic courses on departmental approval.*

27.558 Advanced Graphic Arts II (3 q.h.)
Printmaking in various experimental media. *Prereq. 27.557.*

27.559 Advanced Graphic Arts III (3 q.h.)
Printmaking in various media. *Prereq. 27.558.*

27.560 Oriental Indian Art (2 q.h.)
The national Indian styles of sculpture, painting, and architecture.

27.561 Basic Color and Design I (3 q.h.)
Study and practice of the principles of design and science of color.

27.562 Basic Color and Design II (3 q.h.)
Advanced study in the science of color. *Prereq. 27.561 or equiv.*

27.563 Basic Color and Design III (3 q.h.)
Advanced problems in design. *Prereq. 27.562 or equiv.*

27.564 Advanced Color and Design (3 q.h.)
Creative expression in various color and design problems.

27.571 Basic Commercial Design I (3 q.h.)
Study and creative work in layout, illustration, advertising, and typography.

27.572 Basic Commercial Design II (3 q.h.)
Advanced commercial design problems. *Prereq. 27.571 or equiv.*

27.573 Basic Commercial Design III (3 q.h.)
Advanced commercial design problems. *Prereq. 27.572 or equiv.*

27.574 Advanced Commercial Design (3 q.h.)
Creative problems in illustration design.

27.587 History of Photography I (2 q.h.)
Early developments in photography from ancient times to the daguerreotype.

27.588 History of Photography II (2 q.h.)
Developments of modern photography from the work of Stieglitz to the present. *Prereq. 27.587 or equiv.*

27.589 History of Photography III (2 q.h.)
Study of styles in contemporary photography with emphasis on major modern photographs. *Prereq. 27.588 or equiv.*

27.591 Art Seminar (2 q.h.)
Specific techniques, problems, and theories in art. Students will be responsible for research projects and papers.

27.592 New York Art Seminar (2 q.h.)
Study and inspection of the painting collections in the Metropolitan Museum of Art, Frick Collection, Museum of Modern Art, and the Guggenheim Museum.

27.594 European Art Seminar (2 q.h.)
A four-week study and travel seminar through major European art centers, with emphasis on the major works of art in each.

27.597 History and Technique of Film Art I (2 q.h.)
A study of the development of film art in Europe and America from its origins to 1945.

27.598 History and Technique of Film Art II (2 q.h.)
A study of the development of film art in the United States and Europe from 1945 to the present. *Prereq. 27.597.*

27.599 History and Techniques of Film Art III (2 q.h.)
Study of films by major contemporary directors. *Prereq. 27.598.*

27.600 Honors Program I (4 q.h.)
Prereq. Approval of the Dean.

27.601 Honors Program II (4 q.h.)
Prereq. 27.600.

27.602 Honors Program III (4 q.h.)
Prereq. 27.601.

27.603 Mexican Art (2 q.h.)
Pre-Columbian from the Archaic and Classical periods in the present.

28—MUSIC

Consultant: Prof. R. L. Nadeau, Chairman, Music Dept. (L.A. College)

28.501 Introduction to Music (2 q.h.)
The principal concern is to teach the student a technique for listening actively to music. The course surveys and analyzes works by J. S. Bach, Mozart, Beethoven, Wagner, Stravinsky, and others.

28.503 Women in Music (2 q.h.)
A study in depth of the historical role of women in music; woman as composer, performer, patron, inspiration.

28.507 Fundamentals of Music I (for non-majors) (2 q.h.)
A course for beginners who are not music majors. The development of music reading and hearing skills. Simple notation of pitch and rhythm. Scales, intervals, chords.

28.508 Fundamentals of Music II (2 q.h.)
Continuation of course 28.507. New students admitted upon examination. Dictation, part-singing, and sight-singing. Beginning instrumental studies in recorder. *Prereq. 28.507 or equiv.*

28.509 Fundamentals of Music III (2 qh.)
Continuation of course 28.508. New students admitted upon examination. Major, minor, and modal melodies. Seventh-chord symbols. Voice leading, cadences. Chorale analysis. Continuation of instrumental studies on recorder. *Prereq. 28.508 or equiv.*

28.510 Music and Art (2 q.h.)
A chronological survey of the relationship between music and art comparing the musical styles of great composers and the pictorial qualities of the master painters of our heritage.

28.511 History of Music (2 q.h.)
A survey of the historical trends in music from ancient times to the present. Men, ideas, and events which have influenced change in musical style will be highlighted. From this course, the student should gain a broad overview of musical literature and history which will enhance his understanding and future concert-going.

28.515 Contemporary Music (2 q.h.)
Contemporary music and its techniques seen as a mirror of our time. Major composers studied include Stravinsky, Debussy, Ravel, Bartok, Prokofiev, Hindemith, Milhaud, and Schoenberg.

28.517 Music as a means of Social Expression (formerly Music as the Expression of Man) (2 q.h.)
A general and philosophical view of music in Western culture covering the following: aspects of social relevance; compositional style in various periods; and important themes, (war and peace, love and rejection, etc.) examined in a musical context. When pertinent, related concepts from the fine arts and from philosophy will be explored. Live performance, recordings, and audiovisual media will be used.

28.520 Musical Forms (2 q.h.)
The fugue, the sonata, theme and variations, rondo, the lied; analysis of the symphony, the string quartet, the opera, and the tone poem.

28.521 The Symphony (2. q.h.)
A thorough study of the symphonies of Haydn, Mozart, Beethoven, Berlioz, Brahms, Dvorak, and Tchaikovsky.

28.522 The Concerto (2 q.h.)
The evolution of the concerto from its origins in the Baroque period to its use in our time. Concertos for every instrument are studied, including piano, cello, violin, horn, organ, and bassoon.

28.523 Great Literature for the Piano (2 q.h.)
The study of pianoforte music written in the nineteenth and early twentieth centuries by masters such as Beethoven, Chopin, Schumann, Liszt, Debussy, and Ravel.

28.524 The World of Opera (2. q.h.)
Distinctions will be made between music drama and the number opera. Students

will be required to acquire librettos. Aria, recitative, ensemble, and other basic elements of opera will be isolated and discussed.

28.526 Jazz: Evolution and Essence (2 q.h.)
The many roots of jazz and its development from the worksong and the vocal blues to the avant-garde experiments of today. Contributions of the major performers: soloists, arrangers, composers. The problems of "on-the-spot" creativity and personal expression. The "beat." Multiplicity of accent.

28.528 Ear Training I (2 q.h.)
Rhythmic articulation. Solmization studies in major keys; G and F Clef. Conductor's beat patterns in simple meter. Rhythmic and melodic dictation in major keys. Interval studies.

28.529 Ear Training II (2 q.h.)
Continuation of course 28.528. Solmization studies in major keys with chromatics, and in minor keys: G, F, and C clef. Conductor's beat patterns in simple and compound meter. Melodic dictation in major and minor keys. Harmonic dictation. Interval studies. *Prereq. 28.528 or equiv.*

28.530 Ear Training III (2 q.h.)
Continuation of course 28.529. Advanced rhythmic, melodic, and harmonic dictation. Sight singing of one- and two-part melodies in major and minor keys, with chromatics. Modulation. Singing in four parts. Advanced interval studies. *Prereq. 28.529 or equiv.*

28.531 Life and Works of J. S. Bach (2 q.h.)
A comprehensive survey of the music and background of J. S. Bach with four areas of concentration: Bach and the figured bass; the young Bach (Baroque Romanticism); Bach, the churchman; Bach, the secular composer.

28.532 Life and Works of Mozart (2 q.h.)
Mozart's mastery in all fields of music with particular emphasis on his development of the symphony and his achievements in opera. The man, as seen through his letters, as performer and composer.

28.533 Life and Works of Beethoven (2 q.h.)
An analysis of the complex personality and art of this supreme musical genius. His relation to the turbulent times in which he lived; his role as the great transitional figure in the passage from Classicism to Romanticism. His psychological and aesthetic growth will be observed by studying similar forms written in different periods of his life.

28.534 Pedagogy of Music I (2 q.h.)
Introduction to philosophy principles and procedures in the teaching of music.

28.535 Pedagogy of Music II (2 q.h.)
Procedures, program planning, and techniques in teaching vocal and instrumental music. *Prereq. 28.534 or consent of instructor prior to registration.*

28.536 Pedagogy of Music III (2 q.h.)
Methods, procedures, and materials of/for advanced vocal and instrumental

music instruction. *Prereq. 28.534, 28.535 or consent of instructor prior to registration.*

28.540 The Black Artist in Music (2 q.h.)
General survey of Afro-American music in the U.S. traced from its origins in Africa to the present. Emphasis on jazz, its history, and an analysis of the contributions of major innovative figures. Sources and origins of jazz, as well as their contemporary extensions will be studied. Intended to introduce the student to the vast and rich expanses of black musical culture, from both a musical and a socio-historical standpoint.

28.541 Nationalism in Music (2 q.h.)
The relationship of folk song, dance, and art to symphonic literature; nationalistic elements in the music of Dvorak, Tchaikovsky, Grieg, Copland, Shostakovich, Sibelius; the effect of ideology on composers; the Soviet composers.

28.542 Music of the U.S.A. (2 q.h.)
American music from the colonial times to the present, influence of Stravinsky and Schoenberg on American composers, music for the theater, jazz, electronic music, and contemporary music trends.

28.543 Great Choral Literature (2 q.h.)
A study of sacred and secular choral literature from medieval to contemporary times.

28.544 Chamber Music (2 q.h.)
Ensemble music for small groups. Examples for analysis are selected from the Baroque Period to contemporary styles.

28.545 Wagner's Ring Cycle (2 q.h.)
An in-depth study of Wagner's Cycle of music drama: Das Rheingold, Walkure, Siegfried Gotterdammerung. Wagner's compositional techniques (e.g., the use of leitmotif and musical metaphor) are examined in detail.

28.546 Life and Work of Stravinsky (2 q.h.)
Le Sacre, Petrouchka, Symphony of Psalms, and more recent works are given detailed attention. His contributions to twentieth-century style: neo-classicism, pandiatonicism, and additive style are analyzed, and his strong influence on other composers is noted.

28.547 The Music of Bruckner and Mahler (2 q.h.)
A study of their major works and aesthetic principles. Large-scale symphonic and vocal works will be examined as a culmination of nineteenth-century Romanticism and as the forerunners of twentieth-century Expressionism.

28.548 Great Love Songs Through the Ages (2 q.h.)
The music of love songs, ballads, chansons, lieder, and opera arias from the Middle Ages to today will be studied, listened to, and discussed.

28.549 A History of Musical Instruments in Western Culture (2 q.h.)
A study of the evolution of musical instruments from the Middle Ages to today.

General principles of instrument construction and the historical contexts of their use through the ages will be discussed. The evolution of changing tastes in instrumental sound will be illustrated through listening to recordings and, whenever possible, through live performance. Field trips to the Boston Museum of Fine Arts (which houses an excellent early instrument collection) and to various instrument builders in the Boston area will help give the student a firsthand view of some ancient and modern instruments.

28.550 Life and Works of Haydn (2 q.h.)
A study of his major works and aesthetic principles. Emphasis on Haydn's contributions to Symphonic form; his oratorios, masses, chamber music, songs, symphonies, and works for the keyboard.

28.551 Life and Works of Brahms (2 q.h.)
The Romantic-Classicist; his technique of germinal motivic construction; a study of his symphonies, concertos, chamber music, the songs, and the Requiem.

28.552 Life and Works of Chopin (2 q.h.)
A comprehensive study of the pianoforte compositions of Chopin including the sonatas, concertos, and the shorter forms such as the waltzes, nocturnes, preludes, mazurkas, etudes, scherzos, polonaises, impromptus, and ballades.

28.553 Melodrama and the Macabre: Aspects of Romanticism in Music (2 q.h.)
The focus of this course is on program music of the Romantic period dealing with strange and macabre subjects. Works studied will include Schubert's Erlkonig, Weber's Der Freischutz, and Berlioz' Symphonie Fantastique. Investigations will be made into the forces which produced this aspect of Romanticism with references to literature and art and how they affected the musical scene.

28.555 Contemporary Opera (2 q.h.)
Almost every major composer including Schoenberg, Berg, Bartok, Stravinsky, Hindemith, and Poulenc have contributed to the opera repertory, thus illustrating twentieth-century style. Among the works studied are: Wozzeck, the Rake's Progress, Dialogue of the Carmelites, and Bluebeard's Castle.

28.571 Piano Class I (2 q.h.)
Fundamentals of music and interval identification. Scales and arpeggios, hands separate. Ear training through keyboard harmony and some emphasis on ensemble playing. Repertoire requirements, early Mozart minuets, etc.

28.572 Piano Class II (2 q.h.)
Scales and arpeggios, hands together. Primary triads in some major and minor keys for improvisation and ear playing. Sight playing and some duet performances. Repertoire: Anna Magdelena. Notebook by J. S. Bach. *Prereq. 28.571 or equiv., or consent of instructor prior to registration.*

28.573 Piano Class III (2 q.h.)
Scales and arpeggios, hands together (2 octaves). Primary triads in all keys adding secondary triads in some keys. Transposition of simple tunes, including The National Anthem, using own accompaniment in all keys. Sight playing,

Diller—Quaille Book II, Repertoire: *Complete Oxford Piano Course. Prereq. 28.572 or equiv., or consent of instructor prior to registration.*

28.590 Directed Study (2 q.h.)
Independent work under the direction of the department upon a chosen topic. *(Limited to qualified students with approval of department chairman.) Prereq. Dept. approval.*

28.591 Off-Broadway Musical Seminar (2 q.h.)
A survey of the music and forms of musicals other than the traditional Broadway show. New York, off-Broadway, and community theater will be studied. Specific off-Broadway musicals will be analyzed in depth.

28.595 Opera Seminar (2 q.h.)
An historical survey of opera. Students will attend performances of several operas and write critical reviews.

28.597 Symphony Seminar (2 q.h.)
An historical survey and analytic study of the symphony orchestra. Students will attend performances of several different symphony orchestras and write critical reviews.

28.598 Musical Comedy Seminar (2 q.h.)
An historical survey and analytic study of musical shows. Students will attend performances and write critical reviews.

28.599 Theory I—Tonal Techniques A (2 q.h.)
Fundamentals. Pitch and rhythmic notation, scales, intervals, chord construction. Basic ear training, melodic and rhythmic dictation.

28.600 Theory II—Tonal Techniques B (2 q.h.)
Chord progression. Realization of figured bass, voice leading, harmonic rhythm. Non-harmonic tones. Melodic and rhythmic dictation. *Prereq. 28.599 or equiv. or consent of instructor prior to registration.*

28.601 Theory III—Eighteenth-Century Harmonic Practice (2 q.h.)
Choral analysis. Seventh chords, secondary dominants, modulation. Melodic and rhythmic dictation. *Prereq. 28.600 or equiv. or consent of instructor prior to registration.*

28.602 Music History I-Musical Literature to 1750 (2 q.h.)
A study of sacred and secular musical literature from the early Middle Ages through the Baroque. Listening to and discussion of monophony, organum, music of the troubadours and trouveres; motets, masses, and secular music by Machaut, Dufay, Josquin, Palestrina, Byrd; Elizabethan music, both vocal and instrumental; early Italian opera; music of the German protestants culminating in the works of Bach and Handel will give the student an evolutionary view of music history and style during this period.

28.603 Music History II-Music of the Classical Period (2 q.h.)
A study of changing musical styles from Stamitz, and the Mannheim School through the works of Haydn, Mozart, and early Beethoven.

28.604 Music History III-Music of the Romantic Era (2 q.h.)
Musical styles of the nineteenth century. The role of music and the musician in the changing social, economic, political, and cultural structure of Europe. Music by Beethoven, Schubert, Berlioz, Brahms, Verdi, and Wagner will be heard, discussed, and analyzed.

28.605 Theory IV (2 q.h.)
Non-dominant seventh, ninth, eleventh, and thirteenth chords. Linear embellishment of harmony and harmonization of melody. Keyboard harmony. Melodic and rhythmic dictation; part singing. *Prereq. 28.601 or equiv. or consent of instructor prior to registration.*

28.606 Theory V (2 q.h.)
Analysis of appropriate period forms and compositions. Chromatic and other non-diatonic harmony. Advanced modulation. Keyboard harmony. Melodic-rhythmic dictation and part singing. *Prereq. 28.605 or equiv. or consent of instructor prior to registration.*

28.607 Theory VI (2 q.h.)
Continuing analysis of compositions and period forms. Modern chord symbols. Basic principles of serial writing. Keyboard harmony. Melodic-rhythmic dictation and part singing. *Prereq. 28.606 or equiv. or consent of instructor prior to registration.*

28.608 Contrapuntal Techniques I (2 q.h.)
A study of sixteenth-century counterpoint. *Prereq. 28.599 or equiv.*

28.609 Contrapuntal Techniques II (2 q.h.)
A study of seventeenth- and eighteenth-century counterpoint. *Prereq. 28.608 or equiv. or consent of instructor prior to registration.*

28.611 Musical Performance I (1 q.h.)
Participation in rehearsals and public performances and/or research, composition, arranging, conducting, solo and ensemble activity, etc., with the NU Symphony Orchestra, the Early Music Players, the NU Chorus, the NU Bands, or other ensembles under the supervision and coaching of a faculty member of the Department of Music. The student's progress will be evaluated at the end of the quarter by audition or otherwise. *Prereq. Audition or permission of instructor.*

28.612 Musical Performance II (1 q.h.)
Prereq. Audition or permission of instructor.

28.613 Musical Performance III (1 q.h.)
Prereq. Audition or permission of instructor.

28.614 Musical Performance IV (1 q.h.)
Prereq. Audition or permission of instructor.

28.695 Honors Program I (4 q.h.)
Prereq. Permission of Dean.

28.696 Honors Program II (4 q.h.)
Prereq. 28.695.

28.697 Honors Program III (4 q.h.)
Prereq. 28.696.

29—SPEECH AND THEATRE ARTS

Consultant: Prof. E. J. Blackman, Chairman, Drama and Speech Dept. (L.A. College)

29.501 Effective Speaking 1 (2 q.h.)
Selection and organization of speech materials, essentials of good platform delivery, individual and class criticism of both prepared and impromptu speeches. A practical course devoted to developing an ability to speak easily, naturally, and forcefully.

29.502 Effective Speaking II (2 q.h.)
This course builds upon the techniques and principles developed in Effective Speaking I by stressing increased student proficiency. Speech organization and delivery of more complex materials with which the student is likely to be confronted in business, industry, or the professions will be studied. *Prereq. 29.501.*

29.503 Effective Speaking III (2 q.h.)
The individual speaker as part of a group. The role of discussion in problem analysis, problem solving, and policy making. The principles and methods of organizing and participating in group discussions. Parliamentary procedure. *Prereq. 29.502.*

29.504 Voice and Articulation I (2 q.h.)
A practical course aimed at developing the speaking voice; special emphasis on articulation, pitch control, vocal variety, and flexibility; basic theory of the vocal mechanism.

29.505 Voice and Articulation II (2 q.h.)
Study of the science of speech sounds, investigation of regionalisms, individual voice development. *Prereq. 29.504.*

29.506 Oral Interpretation (2 q.h.)
Application of basic vocal techniques to the dramatic interpretation of various forms of literature.

29.507 Business and Professional Speaking (2 q.h.)
Practice in the organization and presentation of material to fit varying audiences. Emphasis on techniques of delivery and effective presentation of ideas.

29.508 Argumentation and Discussion (2 q.h.)
Designed to acquaint the student with the basic concepts of argumentation (evidence, research, refutation). Emphasis is placed on the psychology of an audience and various types of group discussion.

29.509 Parliamentary Procedure (2 q.h.)
Methods of conducting and organizing meetings. Development of effective leadership techniques. Experience in chairing a meeting and applying rules of order.

29.511 Introduction to Theatre Arts (2 q.h.)
A course aimed at developing in theatregoers an appreciation of the total theatre experience, by studying the roles played by the artists and craftsmen of the theatre in bringing the playwright's script to life. The role of the director, actors, and designers. The role of the audience as critics.

29.521 Introduction to Dramatic Literature (2 q.h.)
The relationship between drama as literature and as theatre. Types of drama: comedy, tragedy, melodrama, farce, and drawing-room comedy. The dramatist's attitude and his style: Classicism, Romanticism, Realism, Naturalism, and Theatricalism.

29.522 Masters of the Theatre I (2 q.h.)
The plays in relationship to their times, the theatres in which they were performed, and the dramatic theory of the age. An examination of selected plays from the Classical Greek and Roman, Medieval religious and secular, and Elizabethan theatre.

29.523 Masters of the Theatre II (2 q.h.)
The art of the Italian commedia dell'arte, the Neoclassic theatre of Racine, Moliere, and Dryden, the Restoration theatre, and the plays of Goldsmith and Sheridan.

29.524 Modern European Drama (2 q.h.)
An examination of European drama of the late nineteenth century and of the twentieth century reflecting the changing views toward the nature of man and the techniques of theatre.

29.525 Modern British Drama (2 q.h.)
The drama of England and Ireland of the twentieth century reflecting the impact of modern life upon modern theatre.

29.526 Modern American Drama (2 q.h.)
A view of American drama from 1900 to the present time. The American playwright reflecting the social, philosophical, and psychological temper.

29.527 Interpersonal Communications I (2 q.h.)
Ways of becoming more aware of self and one's relation to others. An exploration of various options for communicating and increasing one's knowledge of the group process. (enrollment limited)

29.528 Interpersonal Communications II (2 q.h.)
A continuation of 29.527. *Prereq. 29.527.* (enrollment limited)

29.529 Interpersonal Communications III (2 q.h.)
A continuation of 29.528. *Prereq. 29.528.* (enrollment limited)

29.531 Contemporary Film (2 q.h.)
A survey of world film from the days of Edison's experiments to the present. Evaluation and critical review of representative films. Viewing of outstanding films.

29.535 Workshop in Play Production I (2 q.h.)
Training for the beginning director of plays. The organization of the producing unit. Play selection. Casting. Script analysis. Production style. Creating the floor plan. Directing simple scenes in the proscenium theatre.

29.536 Workshop in Play Production II (2 q.h.)
Studying of composition and picturization. Rehearsal techniques. Directing of simple scenes. *Prereq. 29.535.*

29.537 Workshop in Play Production III (2 q.h.)
Directing in the arena theatre, as well as in proscenium theatre. *Prereq. 29.536.*

29.541 Workshop for the Actor I (2 q.h.)
Physical preparation. Basic stage movement and deportment; the control of the stage voice; the analysis and establishment of characterization through observation and awareness of the body; improvisations and short scenes.

29.542 Workshop for the Actor II (2 q.h.)
Psychological preparation. The analysis and establishment of characterization through memory, emotion, imagination, and recall. Analysis of specific roles, the creation of a character analysis book, improvisations and short scenes.

29.543 Workshop for the Actor III (2 q.h.)
Preparing and performing the role. The physical and psychological preparation of specific roles. Short classroom scenes; the presentation of a one-act play.

29.550 The Comic Theatre (2 q.h.)
An examination of the writing and the staging of works by Aristophanes, Moliere, Shaw, Neil Simon. The nature, the functions, the techniques of comic writing and comic performance.

29.551 Of and By Women in the Theatre (2 q.h.)
The changing role of women as reflected in plays about and by women.

29.552 The Off-Broadway Theatre (2 q.h.)
The playwrights, the performers, and the audience of contemporary Off-Broadway theatre.

29.561 Announcing I (2 q.h.)
A course dealing with the delivery of all types of radio commercials.

29.562 Announcing II (2 q.h.)
A course dealing with the delivery of prepared as well as ad lib materials so that the announcer may strengthen his spontaneous broadcast speech abilities. *Prereq. 29.561.*

29.563 Announcing III (2 q.h.)
A course dealing with a variety of ad lib program types in both radio and television to aid the announcer in developing his ability to think quickly and speak fluidly and dynamically. *Prereq. 29.562.*

29.595 Charles Playhouse Seminar (2 q.h.)
A seminar designed to teach students how to appreciate the experience of theatregoing through pre-show preparation and post-show critique, under the guidance of a faculty member as well as Charles Theatre artistic personnel.

29.596 New York Theatre Seminar (2 q.h.)
A seminar aimed at introducing the theatre arts to students by varied theatregoing experiences as well as formal class discussions, and studying the role of the New York stage in shaping contemporary American theatre.

29.597 London Theatre Seminar (2 q.h.)
Examination of the contemporary London theatre scene by viewing and evaluating representative productions.

29.598 Stratford Shakespeare Seminar (2 q.h.)
Seminar designed to give students an opportunity to attend four performances at the Stratford Festival Theatre: to meet with Festival actors, directors, designers; to tour the theatre plant; and to evaluate contemporary Shakespearian productions.

29.599 Creative Dramatics
Theories and methods of relating the creative techniques of pantomime, improvisations, dramatization; and to work with children's programs in schools, churches, recreation facilities.

29.600 Children's Theatre
Analysis and creation of dramatic literature for children; the developing of a production for children.

30—ENGLISH

Consultant: Prof. P. C. Wermuth, Chairman, English Dept. (L.A. College)

Assoc. Consultants: Dean H. Vetstein (L.A. College); Prof. M. Lesser (L.A. College)

Each student enrolled in Composition and Rhetoric (30.601 and 30.603) will take a Placement Examination during class. Some students may be requested to register for Elements of Composition (30.600), a 2 q.h. course designed to upgrade the student's background.

Courses required for Liberal Arts Majors are:

30.601, 30.602 Composition and Rhetoric I & II (or 30.603 Intensive)
and
30.604, 30.605 Introduction to Literary Forms I & II (or 30.606 Intensive)

For other majors, refer to English requirement listed under major.

During the changeover of English requirements, the following will apply:

Students who have successively completed:
30.504 may register for 30.602

30.505 may register for 30.604

30.507 may register for 30.605

30.501 English for International Students I (2 cl., non-credit)
Introduction to English grammar for foreign-speaking students with an emphasis on listening, speaking, and writing; selected readings and exercises to strengthen vocabulary and pronunciation.

30.502 English for International Students II (2 cl., non-credit)
A continuation of 30.501 emphasizing the preparation of written and oral reports, and business and social correspondence.

30.503 English for International Students III (2 cl., non-credit)
Advanced work in written and spoken English preparatory to entering 30.601, Composition and Rhetoric I.

30.511 Business Writing and Reports I (2 q.h.)
Developing an appropriate vocabulary and a business letter-writing philosophy.

30.512 Business Writing and Reports II (2 q.h.)
Planning, writing, and analyzing effective business letters. *Prereq. 30.511 or equiv.*

30.513 Business Writing and Reports III (2 q.h.)
Researching, organizing, documenting, and writing semi-technical and business reports. *Prereq. 30.512 or equiv.*

30.514 Technical Writing I (2 q.h.)
Introduction to types of technical documentation, memoranda, and technical reports. Writing of reports. *Prereq. 30.506 or equiv.*

30.515 Technical Writing II (2 q.h.)
Proposals, technical manuals, and graphic aids for printed documents and presentations. *Prereq. 30.514 or equiv.*

30.516 Technical Writing III (2 q.h.)
Technical writing, editing, and documentation, including information retrieval, programmed instruction, and reproduction processes. *Prereq. 30.515 or equiv.*

30.517 Intermediate Writing (2 q.h.)
Practice in expository and imaginative writing in a variety of forms, designed to help the student discover his own style. Individual attention to the student's work. *Prereq. 30.506, 30.602 or equiv.*

30.518 Creative Writing I (2 q.h.)
A workshop in writing short fiction. *Prereq. 30.517 or equiv.*

30.519 Creative Writing II (2 q.h.)
A workshop in analyzing and editing the participants' short fiction. *Prereq. 30.518 or equiv.*

30.522 Introduction to Semantics I (2 q.h.)
The effect of language habits on thinking processes and on social relationships. *Prereq. 30.506, 30.509, or equiv.*

30.523 Introduction to Semantics II (2 q.h.)
A formulaic examination of language. *Prereq. 30.522 or equiv.*

30.525 The English Language I (2 q.h.)
An introduction to the scientific study of the backgrounds and historical development of the English language. *Prereq. 30.506, 30.509, or equiv.*

30.526 The English Language II (2 q.h.)
An examination of sounds, grammar, and usage. *Prereq. 30.525 or equiv.*

30.527 The English Language III (2 q.h.)
The problem of meaning and the symbolic nature of language. *Prereq. 30.526 or equiv.*

30.531 Western World Literature I (2 q.h.)
The Classical Age.

30.532 Western World Literature II (2 q.h.)
The Bible and the Middle Ages.

30.533 Western World Literature III (2 q.h.)
The Renaissance.

30.534 Western World Literature IV (2 q.h.)
The Neoclassical Age.

30.535 Western World Literature V (2 q.h.)
The Enlightenment.

30.536 Western World Literature VI (2 q.h.)
The Romantic Age and the rise of Realism.

30.537 Modern Irish Literature I (2 q.h.)
Irish literature in English from 1885 to 1920 (fiction, drama, and verse). Concentration will be on such major figures as the early Yeats, Synge, Lady Gregory, O'Flaherty, and the early Joyce.

30.538 Modern Irish Literature II (2 q.h.)
Irish literature in English from 1920 to the present (fiction, drama, and verse). Concentration will be on such major figures as the later Yeats, O'Casey, O'Faolain, the later Joyce, O'Connor, Behan, Lavin, and Montague.

30.539 The Irish Influence in Selected Modern American Literature (2 q.h.)
A survey of the Irish imagination, themes, and attitudes as embodied in the fiction and drama of a number of twentieth-century American writers: O'Neill's "Touch of the Poet," Donleavy's "Ginger Man," O'Connor's "Last Hurrah," Alfred's "Hogan's Goat," and McHale's "Farragan's Retreat." *(Partially fulfills American Literature requirement for majors).*

30.541 English Literature I (2 q.h.)
From early English to 1700.

30.542 English Literature II (2 q.h.)
From Neoclassicism to Romanticism.

30.543 English Literature III (2 q.h.)
From the Victorian Age to the present.

30.544 American Literature I (2 q.h.)
From Colonial times to Poe.

30.545 American Literature II (2 q.h.)
The American Renaissance: Emerson, Thoreau, Hawthorne, Melville, and Whitman.

30.546 American Literature III (2 q.h.)
From 1865 to the present.

30.547 Science Fiction (2 q.h.)
The myths and rhetorical strategies of science fiction from Mary Shelley's *Frankenstein* through such authors as Vonnegut, Bradbury, Heinlein, and Clarke.

30.548 Images of Women in Literature (2 q.h.)
A descriptive and analytic study of the images of women and the archetypes underlying them in imaginative literature, including such writers as Homer, Austen, Ibsen, Lawrence, Mailer, and Plath.

30.551 Chaucer I (2 q.h.)
"The Canterbury Tales," with attention to Middle English vocabulary, historical setting, and the rhythms and devices of Chaucer's poetry.

30.552 Chaucer II (2 q.h.)
More of "The Canterbury Tales," and a beginning in the text of "Troilus and Criseyde." *Prereq. 30.551 or equiv.*

30.553 Chaucer III (2 q.h.)
An emphasis on "Troilus and Criseyde," and on certain shorter works of Chaucer. *Prereq. 30.552 or equiv.*

30.554 Shakespeare I (2 q.h.)
The Elizabethan theatre, Shakespeare's England, and the pre-1600 plays.

30.555 Shakespeare II (2 q.h.)
The "problematical" comedies and the histories. *Prereq. 30.554 or equiv.*

30.556 Shakespeare III (2 q.h.)
Emphasis on the major tragedies of Shakespeare. *Prereq. 30.555 or equiv.*

30.557 The Seventeenth Century (2 q.h.)
The literature of the Restoration.

30.558 The Eighteenth Century I (2 q.h.)
The age of Pope and Swift.

30.559 The Eighteenth Century II (2 q.h.)
The age of Johnson.

30.561 Spenser (2 q.h.)
"The Faerie Queene," studied as the English culmination of Medieval and Renaissance romantic narrative.

30.562 Milton (2 q.h.)
Close reading of "Paradise Lost," and of such political and theological background as needed. "Samson Agnoistes" will also be read.

30.564 The Old Testament I (2 q.h.)
Selected books from the Old Testament examined for their literary and historical importance.

30.565 The Old Testament II (2 q.h.)
Continuation of 30.564.

30.566 The New Testament (2 q.h.)
Selected books from the New Testament considered in their literary and historical aspects.

30.571 The Nineteenth Century I (2 q.h.)
Wordsworth and Coleridge.

30.572 The Nineteenth Century II (2 q.h.)
Byron, Shelley, and Keats.

30.573 The Nineteenth Century III (2 q.h.)
The Victorian Age.

30.574 The Eighteenth-Century English Novel (2 q.h.)
From Defoe to Austen.

30.575 The Nineteenth-Century English Novel (2 q.h.)
From Bronte to Hardy.

30.576 The Twentieth-Century English Novel (2 q.h.)
From Conrad to the present.

30.577 Conrad (2 q.h.)
Conrad's art related to his Polish heritage, nautical career, theory of life and composition, and literary legacy.

30.578 Afro-American Literature (2 q.h.)
A study of representative black authors of the United States, emphasizing the period from the Civil War to the present.

30.581 The American Short Story (2 q.h.)
The development of the American short story from its nineteenth-century origins to the present.

30.582 The Nineteenth-Century American Novel (2 q.h.)
From Cooper to Crane.

30.583 The Twentieth-Century American Novel (2 q.h.)
From Dreiser to the present.

30.584 Contemporary American Poetry (2 q.h.)
From Frost to the present.

30.585 The Modern European Novel (2 q.h.)
From Proust to the present.

30.586 Literary Criticism (2 q.h.)
Major schools of criticism through a study of Aristotle, Longinus, Sidney, Johnson, and a representative group of moderns.

30.590 Writers' Conference (2 q.h.)
A workshop in which professional writers will analyze participants' manuscripts.

30.591 Honors Program I (4 q.h.)
See page 86.

30.592 Honors Program II (4 q.h.)
Prereq. 30.591.

30.593 Honors Program III (4 q.h.)
Prereq. 30.592.

30.600 Element of Composition (2 q.h.)
An intensive study of grammatical forms and structural patterns of current English.

30.601 Composition and Rhetoric I (2 q.h.)
A detailed examination of the modes of rhetoric, especially exposition and argument, and exercises in the development of paragraphs and short papers. *(Not open to students who have credit for 30.504.)*

30.602 Composition and Rhetoric II (2 q.h.)
A continuation of 30.601. The stress here is on the short paper, the longer library paper, and formal documentation. *(Not open to students who have credit for 30.505.)*

30.603 Composition and Rhetoric (Intensive) (4 q.h.)
Same as 30.601 *plus* 30.602.

30.604 Introduction to Literary Forms I (2 q.h.)
The development of techniques for reading imaginative writing. Short and long fiction are the materials for study, discussion, and two critical papers.

30.605 Introduction to Literary Forms II (2 q.h.)
A continuation of 30.604, but here the materials are poetry and drama.

30.606 Introduction to Literary Forms (Intensive) (4 q.h.)
Same as 30.604 *plus* 30.605.

30.607 The Modern Novel (2 q.h.)
An introductory course in the structure and themes of twentieth-century American, British, and European novels; reading of such writers as Hemingway, and Faulkner, Joyce and Lawrence, Kafka and Camus.

31—FRENCH

Consultant: Prof. L. Cooperstein, Chairman, Modern Language Dept. (L.A. College)

31.601 Elementary French I (4 q.h.)
Essentials of grammar, practice in pronunciation, and progressive acquisition of a basic vocabulary and idiomatic expressions.

31.602 Elementary French II (4 q.h.)
Continuation of grammar study. Oral and written exercises. *Prereq. 31.601 or equiv.*

31.603 Elementary French III (4 q.h.)
Reading of French prose of increasing difficulty, with written and oral exercises based on the materials read; practice in conversation. *Prereq. 31.602 or equiv.*

31.604 Intermediate French I (4 q.h.)
A review of grammar, with practice in composition and conversation. *Prereq. 31.603 or equiv.*

31.605 Intermediate French II (4 q.h.)
History of French civilization, with discussions and conversation. *Prereq. 31.604 or equiv.*

31.606 Intermediate French III (4 q.h.)
Intensive reading of modern French prose, with conversational practice. *Prereq. 31.605 or equiv.*

31.607 Elementary French (Intensive) (12 q.h.)
Stresses the essentials of grammar, practice in pronunciation, and progressive acquisition of a basic vocabulary with idiomatic expressions. Written and oral exercises are based upon simple French prose. Develops into the reading of more difficult work accompanied by practice in conversation. *(Not open to students who have taken 31.601, 31.602, 31.603.)*

31.608 Intermediate French (Intensive) (12 q.h.)
Same as 31.604, 31.605 *and* 31.606. *(Not open to students who have taken 31.604, 31.605, 31.606.)*

31.521. French Literature I (2 q.h.)
Origins of French literature with readings from major works of the Middle Ages. *Prereq. 31.506 or equiv.*

31.522 French Literature II (2. q.h.)
Selections from the Classical period in the seventeenth and eighteenth centuries. *Prereq. 31.521 or equiv.*

31.523 French Literature III (2 q.h.)
Readings from major works of the nineteenth and twentieth centuries. *Prereq. 31.522 or equiv.*

32—SPANISH

32.601 Elementary Spanish I (4 q.h.)
Essentials of grammar, practice in pronunciation, progressive acquisition of a basic vocabulary and idiomatic expressions.

32.602 Elementary Spanish II (4 q.h.)
Continuation of grammar study. Oral and written exercises; reading of Spanish prose of moderate difficulty. *Prereq. 32.601 or equiv.*

32.603 Elementary Spanish III (4 q.h.)
Continuation of grammar study. Oral and written exercises; reading of Spanish prose of moderate difficulty. *Prereq. 32.602 or equiv.*

32.607 Elementary Spanish (Intensive) (12 q.h.)
Stresses the essentials of grammar, practice in pronunciation, and progressive acquisition of a basic vocabulary with idiomatic expressions. Written and oral exercises are based upon simple Spanish prose. Develops into the reading of more difficult work accompanied by practice in conversation. *(Not open to students who have taken 32.601, 32.602, 32.603.)*

32.604 Intermediate Spanish I (4 q.h.)
Review of grammar, with practice in composition and conversation. *Prereq. 32.603, 32.611 or equiv.*

32.605 Intermediate Spanish II (4 q.h.)
Spanish civilization through texts of average difficulty. Intensive reading of modern prose, with occasional oral or written translation; conversation practice based on assigned readings. *Prereq. 32.604 or equiv.*

32.606 Intermediate Spanish III (4 q.h.)
Spanish-American civilization through texts of average difficulty. Intensive reading of modern prose, with occasional oral or written translation; conversation practice based on assigned readings. *Prereq. 32.605 or equiv.*

32.608 Intermediate Spanish (Intensive) (12 q.h.)
Same as 32.604, 32.605 *and* 32.606. *(Not open to students who have had 32.604, 32.605, 32.606.)*

32.609 Conversational Spanish I* (4 q.h.)
This course is intended to provide students with a basic speaking ability and understanding of everyday Spanish. *(No previous background needed.)*

32.610 Conversational Spanish II* (4 q.h.)
Continued building of basic skills in conversational Spanish. *Prereq. 32.609 or equiv.*

32.611 Conversational Spanish III* (4 q.h.)
A continuation of 32.610 *Prereq. 32.610 or equiv.*

32.621 Spanish Literature I (2 q.h.)
Origins of Spanish literature with readings from major works of the Middle Ages, the Romancero, and Mysticism. *Prereq. 32.606 or equiv.*

32.622 Spanish Literature II (2 q.h.)
Selections from Cervantes and other major figures of the Siglo de Oro. *Prereq. 32.621 or equiv.*

32.623 Spanish Literature III (2 q.h.)
Readings from major works of the nineteenth and twentieth centuries. *Prereq. 32.622 or equiv.*

33—GERMAN

33.601 Elementary German I (4 q.h.)
Essentials of grammar; practice in pronunciation; progressive acquisition of a basic vocabulary and idiomatic expressions.

33.602 Elementary German II (4 q.h.)
More difficult points of grammar—particularly uses of subjunctive mood. *Prereq. 33.601 or equiv.*

33.603 Elementary German III (4 q.h.)
Reading of simple German prose, with oral and written exercises based on material read; German conversation encouraged. *Prereq. 33.602 or equiv.*

33.604 Intermediate German I (4 q.h.)
A review of grammar, with practice in composition and conversation. *Prereq. 33.603 or equiv.*

33.605 Intermediate German II (4 q.h.)
History of German civilization, with discussions and conversation. *Prereq. 33.604 or equiv.*

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*Will satisfy the elementary language requirement only.

33.606 Intermediate German III (4 q.h.)
Intensive reading of modern German prose, with conversational practice. *Prereq. 33.605 or equiv.*

34—RUSSIAN

34.601 Elementary Russian I (4 q.h.)
Essentials of grammar; practice in pronunciation and progressive acquisition of a base vocabulary; idiomatic expressions.

34.602 Elementary Russian II (4 q.h.)
Continuation of grammar study; oral and written exercises. *Prereq. 34.601 or equiv.*

34.603 Elementary Russian III (4 q.h.)
Reading of Russian prose of moderate difficulty. *Prereq. 34.602 or equiv.*

34.604 Intermediate Russian I (4 q.h.)
Graded reading from the works of Pushkin, Lermontov, and Turgenev; oral and written practice based on the covered material. *Prereq. 34.603 or equiv.*

34.605 Intermediate Russian II (4 q.h.)
Russian history and civilization through texts of average difficulty; oral practice and composition based on covered material. *Prereq. 34.604 or equiv.*

34.606 Intermediate Russian III (4 q.h.)
Russian history and civilization through texts of average difficulty; oral practice and composition based on covered material. *Prereq. 34.605 or equiv.*

34—JAPANESE

34.621 Elementary Japanese I (4 q.h.)
Essentials of grammar; practice in pronunciation and progressive acquisition of a basic vocabulary; idiomatic expressions.

34.622 Elementary Japanese II (4 q.h.)
Continuation of grammar study; oral and written exercises. *Prereq. 34.621 or equiv.*

34.623 Elementary Japanese III (4 q.h.)
Reading of Japanese prose of moderate difficulty. *Prereq. 34.622 or equiv.*

34.624 Intermediate Japanese I (4 q.h.)
Review of grammar, with practice in composition and conversation. *Prereq. 34.623 or equiv.*

34.625 Intermediate Japanese II (4 q.h.)
Japanese history and civilization through texts of average difficulty; oral practice and composition based on covered material. *Prereq. 34.624 or equiv.*

34.626 Intermediate Japanese III (4 q.h.)
Japanese history and civilization through texts of average difficulty; oral practice and composition based on covered material. *Prereq. 34.625 or equiv.*

34—ITALIAN

34.631 Elementary Italian I (4 q.h.)
Essentials of grammar; practice in pronunciation; and progressive acquisition of a basic vocabulary and idiomatic expressions.

34.632 Elementary Italian II (4 q.h.)
Continuation of grammar study. Oral and written exercises. *Prereq. 34.631 or equiv.*

34.633 Elementary Italian III (4 q.h.)
Reading of Italian prose of increasing difficulty; with written and oral exercises based on the material read; practice in conversation. *Prereq. 34.632 or equiv.*

34.634 Intermediate Italian I (4 q.h.)
A review of grammar, with practice in composition and conversation. *Prereq. 34.633 or equiv.*

34.635 Intermediate Italian II (4 q.h.)
History of Italian civilization with discussions and conversation. *Prereq. 34.634 or equiv.*

34.636 Intermediate Italian III (4 q.h.)
Intensive reading of modern Italian prose, with conversational practice. *Prereq. 34.635 or equiv.*

34—SWAHILI

34.641 Elementary Swahili I (4 q.h.)
Essentials of grammar; practice in pronunciation and progressive acquisition of a basic vocabulary; idiomatic expressions.

34.642 Elementary Swahili II (4 q.h.)
Continuation of grammar study; oral and written exercises. *Prereq. 34.641 or equiv.*

34.643 Elementary Swahili III (4 q.h.)
Reading of Swahili prose of moderate difficulty. *Prereq. 34.642 or equiv.*

34.644 Intermediate Swahili I (4 q.h.)
Review of grammar, with practice in composition and conversation. *Prereq. 34.643 or equiv.*

34.645 Intermediate Swahili II (4 q.h.)
Swahili history and civilization through texts of average difficulty; oral practice and composition based on covered material. *Prereq. 34.644 or equiv.*

34.646 Intermediate Swahili III (4 q.h.)
Swahili history and civilization through texts of average difficulty; oral practice and composition based on covered material. *Prereq. 34.645 or equiv.*

34—CHINESE

34.651 Mandarin Chinese I (4 q.h.)
An introduction to sounds and structure of spoken and written Chinese (the standard or "national language"—*kuo-yu*). Stresses essentials of grammar, sentence pattern drills.

34.652 Mandarin Chinese II (4 q.h.)
Continuation of Chinese I. Essentials of grammar, reading of simple written Chinese. *Prereq. 34.651 or equiv.*

34.653 Mandarin Chinese III (4 q.h.)
Continuation of Chinese II. Grammar, reading Chinese with conversational drill o be based on material covered in class. *Prereq. 34.652 or equiv.*

38—JOURNALISM

Consultant: Prof. G. A. Speers, Chairman, Journalism Dept. (L.A. College)

38.501 History and Principles of Journalism I (2 q.h.)
Journalism from its European origins into the Colonial period. The evolution of press freedoms and principles now and in the Colonial press and the party press.

38.502 History and Principles of Journalism II (2 q.h.)
Journalism from 1800. The "Dark Period," the "Penny Press," and the great personal journalists: Bryant, Bennett, Greeley, Raymond, and others. *Prereq. 38.501 or equiv.*

38.503 History and Principles of Journalism III (2 q.h.)
The "giants" of American journalism in the closing decades of the nineteenth century: Dana, Greeley, Ochs, White, Medill, Pulitzer, Hearst, and others. *Prereq. 38.502 or equiv.*

38.504 Newswriting I (2 q.h.)
Obtaining and organizing facts; the writing of basic news stories. Subjects covered include the five "W's" and the "H" of news, inverted pyramid form, news values, and leads.

38.505 Newswriting II (2 q.h.)
Analysis of different types of news stories through assignments and class discussions; building news stories; news interview stories, and other types. *Prereq. 38.504.*

38.506 Newswriting III (2 q.h.)
Investigative reporting, feature stories, editorials. Copyediting exercises and assignments in specialized writing. Libel, slander, and other legal matters affecting journalism. *Prereq. 38.505 or equiv.*

38.507 Techniques of Journalism I (2 q.h.)
Techniques of journalism, stressing actual assignments and classroom dis cussion of students' work. Course applies basic newswriting practices to as signments. *Prereq. 38.506 or equiv.*

38.508 Techniques of Journalism II (2 q.h.)
Focus on handling stories that emanate from various "beats," including court and government beats; and investigative reporting. *Prereq. 38.507 or equiv.*

38.509 Techniques of Journalism III (2 q.h.)
Concentration on fields of "specialities" of business, sports, editorials, an student development of a special project in journalism. *Prereq. 38.508 o equiv.*

39—ECONOMICS

Consultant: Prof. M. A. Horowitz, Chairman, Economics Dept. (L.A. College *Associate Consultant:* Prof. H. Goldstein (L.A. College)

39.501 Economic Principles and Problems I (2 q.h.)
Macro analysis—national income concepts and determination; macro economi goals and problems; monetary and fiscal policy.

39.502 Economic Principles and Problems II (2 q.h.)
Micro analysis—theory of the firm and market structure; supply, demand market price; international economics. *Prereq. 39.501 or equiv.*

39.503 Economic Principles and Problems III (2 q.h.)
Applications of economic principles to selected problem areas: poverty, com petition, labor, agriculture, urban. *Prereq. 39.502 or equiv.*

39.504 Economics (Intensive) (6 q.h.)
Macro analysis—national income concepts and determination; macro economi goals and problems; monetary and fiscal policy. Micro analysis—theory of the firm and market structure; supply, demand, market price; international eco nomics. Applications of economic principles to selected problem areas: poverty competition, labor, agriculture, urban. *(Not open to students who have taker 39.501, 39.502, 39.503.)*

39.505 Economics A (3 q.h.)
Same as 39.501 plus the first half of 39.502.

39.506 Economics B (3 q.h.)
Same as the second half of 39.502 plus 39.503. *Prereq. 39.505 or equiv.*

39.507 Intermediate Economic Theory I (2 q.h.)
Classical equilibrium theory. Theory of demand, supply, and the market price. Marginal analysis. *Prereq. 39.503 or equiv.*

39.508 Intermediate Economic Theory II (2 q.h.)
Determination of price and output in the context of the theory of the firm. *Prereq. 39.507 or equiv.*

39.509 Intermediate Economic Theory III (2 q.h.)
Introduction to mathematical analysis and a comprehensive analysis of the theory of distribution. *Prereq. 39.508 or equiv.*

39.511 Statistics I (2 q.h.)
Introduction to the collection and organization of data. Concentration on the nature, computation, and uses of measures of central tendency and variability. *Prereq. 39. 503 or equiv.*

39.512 Statistics II (2 q.h.)
Introduction to statistical inference, parameters of samples, tests of significance, "t" distribution, and chi square. *Prereq. 39.511 or equiv.*

39.513 Statistics III (2 q.h.)
Introduction to the analysis of variance, trend fitting, linear regression, seasonal adjustment, and index numbers. *Prereq. 39.512 or equiv.*

39.514 Statistics (Intensive) (6 q.h.)
Introduction to the collection and organization of data. Concentration on the nature, computation, and uses of measures of central tendency and variability. Introduction to statistical inference, parameters of samples, tests of significance, "t" distribution, and chi square. Introduction to the analysis of variance, trend fitting, linear regression, seasonal adjustment, and index numbers. *(Not open to students who have taken 39.511, 39.512, 39.513.) Prereq. 39.503 or equiv.*

39.517 Money and Banking I (2 q.h.)
Introduction to money and credit, commercial banking structure, and money creation; problems and policy of central banking in the United States. *Prereq. 39.503 or equiv.*

39.518 Money and Banking II (2 q.h.)
Theory of money and prices and monetary policy; interest theory, debt management, and international monetary problems and analysis. *Prereq. 39.517 or equiv.*

39.519 Public Finance (2 q.h.)
Analysis of the growth and development of the public sector of the economy. Public finance policies, intergovernment fiscal relations. *Prereq. 39.518 or equiv.*

39.521 Economic Growth and Development I (2 q.h.)
Analysis of the development of the Western market system. Introduction to economic growth and alternative approaches to economic development.
Prereq. 39.503 or equiv.

39.522 Economic Growth and Development II (2 q.h.)
An introductory analysis of the role of economic factors and institutions as

well as an examination of the effect of psychological social and political influences upon economic development. *Prereq. 39.521 or equiv.*

39.523 Government and Business I (2 q.h.)
Role of Government in national economic affairs—theory and practice. *Prereq. 39.503 or equiv.*

39.524 Government and Business II (2 q.h.)
The relationship between government and business and anti-trust laws. *Prereq. 39.523 or equiv.*

39.525 American Economic History (2 q.h.)
Economic development of the United States with emphasis upon the post Civil War period and selected European developments. *Prereq. 39.503 or equiv.*

39.526 Government and Business III (2 q.h.)
Application of anti-trust laws to business—emphasis upon cases, principles, and current anti-trust problems. *Prereq. 39.524 or equiv.*

39.527 Labor Economics (2 q.h.)
Development of labor organizations, their aims and methods. Issues in collective bargaining and public policy toward labor. *Prereq. 39.503 or equiv.*

39.528 International Economics I (2 q.h.)
Economics of international trade, tariffs and resource use, and balance of payments mechanisms. *Prereq. 39.503 or equiv.*

39.529 International Economics II (2 q.h.)
International commercial policy, financial organizations, and recent problems. *Prereq. 39.528 or equiv.*

39.530 Comparative Economic Systems (2 q.h.)
Analysis and evaluation of different economic systems: capitalism, socialism, communism, and fascism. *Prereq. 39.503 or equiv.*

39.531 Business Cycles I (2 q.h.)
Intermediate marco economic theory. Theory of cyclical fluctuations in the context of multiplier and accelerator models. *Prereq. 39.503 or equiv.*

39.532 Business Cycles II (2 q.h.)
Business cycle analysis, measurement, and public policy. *Prereq. 39.531 or equiv.*

39.533 Business Cycles III (2 q.h.)
Business cycle forecasting methods and services. *Prereq. 39.532 or equiv.*

39.536 Advanced Statistics I (2 q.h.)
Advanced topics in sampling and statistical inference as a management aid. *Prereq. 39.503, 39.513 or equiv.*

39.537 Advanced Statistics II (2 q.h.)
Elements in probability theory and the decomposition of economic change into secular, seasonal, and cyclical variation. *Prereq. 39.536 or equiv.*

39.538 Advanced Statistics III (2 q.h.)
Advanced topics in statistical inference, regression, and correlation and index numbers. *Prereq. 39.537 or equiv.*

39.539 Managerial Economics (2 q.h.)
An application of the theory of demand, price, and output to the business firm and capital budgeting. *Prereq. 39.503 or equiv.*

39.540 History of Economic Thought (2 q.h.)
Development of economic theory through Keynesian and post-Keynesian analysis. *Prereq. 39.503 or equiv.*

39.551 Industrial Organization (2 q.h.)
An extension and application of micro-theory to structure and performance of American industry. Anti-trust policy and analysis. *Prereq. 39.503 or equiv.*

39.561 Urban Economics (2 q.h.)
A study of urban affairs in the context of economic principles. *Prereq. 39.503 or equiv.*

39.571 European Economic History (2 q.h.)
An analysis of European economic affairs after the industrial revolution. The twentieth century and recent integration policies and their analysis. *Prereq. 39.503 or equiv.*

39.581 Economic Policy Seminar (2 q.h.)
Capstone course for senior majors with stress upon independent study and contemporary issues. *Prereq. 39.509, 39.531, or equiv.*

40—LIBRARY SCIENCE

Consultant: Mr. Frank Seegraber, Boston College

40.501 Introduction to Library Science (2 q.h.)
Brief survey of the history of books and librarianship. The development of libraries in the United States with some emphasis on recent federal and state library legislation. The library profession, its philosophy, publications, and organizations.

40.502 Selection of Library Materials (2 q.h.)
Principles and practices in the selection of multi-media materials for the modern library; bibliographic aids to selection; practice in preparation of book notes and book reviews.

40.511 Organization of the Library (2 q.h.)
The organization, administration, and services of municipal libraries; public

library systems in the United States; the role of public libraries as educational institutions.

40.512 Multi-Media Centers (Formerly Building and Administering the School Library) (2 q.h.)
Organization and management of elementary and secondary school libraries; problems in the selection and evaluation of multi-media materials necessary to the school curriculum.

40.513 Administration of Multi-Media Centers (Formerly School Library Administration) (2 q.h.)
The library as a media center for instructional materials; problems in personnel and budgeting; the library's role in the school curriculum and its services to students and faculty.

40.514 Multi-Media Materials and Services (Formerly Audio-Visual Materials and Services) (2 q.h.)
The selection, organization, and use of multi-media materials in school libraries; types of equipment and services; cataloging of non-print materials.

40.521 Introduction to Reference Materials and Methods (2 q.h.)
The basic tools and methods for locating information. Evaluation of dictionaries, encyclopedias, gazetteers and atlases, handbooks, almanacs, directories, and indexes.

40.522 Reference Work in The Social Sciences (2 q.h.)
Scope and use of outstanding reference materials in the broad range of the social sciences—economics, education, political science, sociology, and allied fields. *Prereq. 40.521 or equiv.*

40.523 Reference Work in The Humanities (2 q.h.)
Development of the book, and the beginnings of enumerative and descriptive bibliography. Approaches to the solution of reference problems in the humanities, with special emphasis on literature. *Prereq. 40.521 or equiv.*

40.526 Library Community Relations (2 q.h.)
An exploration of creative approaches and practical techniques for reaching individuals and groups with dynamic library science. Emphasis on modern public relations methods and media.

40.531 Descriptive Cataloging (2 q.h.)
Theory and practice of descriptive cataloging, introducing techniques of compiling author, corporate, and serial entries.

40.532 Subject Headings and Classification (Formerly Descriptive Cataloging and Classification) (2 q.h.)
Introduction to Dewey Decimal Classification and Sears subject headings; further study of descriptive cataloging in book and non-book materials. *Prereq. 40.531 or equiv.*

40.533 Library of Congress Classification (2 q.h.)
The significant differences between LC and Dewey. Notes on original cataloging and techniques of classification within the LC scheme. Use of LC outlines and tables. *Prereq. 40.531 or equiv.*

40.541 Introduction to Children's Literature (2 q.h.)
The history of children's literature; current trends in its publication and social forces that influence its production; criteria for evaluation and aids for selection of types of children's books.

40.542 Library Service to Young People (2 q.h.)
Study of adolescent needs in the field of literature with application to both public and school libraries; special attention to the problem of material selection, book talks, and discussion groups.

40.533 Library of Congress Classification (2 q.h.)
The significant differences between LC and Dewey. Notes on original cataloging and techniques of classification within the LC scheme. Use of LC outlines and tables. *Prereq. 40.531 or equiv.*

40.541 Introduction to Children's Literature (2 q.h.)
The history of children's literature; current trends in its publication and social forces that influence its production; criteria for evaluation and aids for selection of types of children's books.

40.542 Library Service to Young People (2 q.h.)
Study of adolescent needs in the field of literature with application to both public and school libraries; special attention to the problem of material selection, book talks, and discussion groups.

BUSINESS ADMINISTRATION

All course descriptions carry an indication of which quarter(s) a particular course will be offered. Any course sequence not reporting an indication will have Part I offered in the Fall, Part II in the Winter, and Part III in the Spring Quarter. The campus availability of courses is also indicated after the description. Please refer to the Schedule of Courses and Registration Guide for details.

41—ACCOUNTING

Consultant: Prof. J. W. Golemme (College of Business Admin.) 437-3244
Coordinator: C. P. Carter, Asst. Prof. (College of Business Admin.) 437-3245

41.501 Accounting Principles I (2 q.h.) (Offered every quarter)
The basic concepts and methodology of accounting for service and merchandising businesses. (Offered on all campuses)

41.502 Accounting Principles II (2 q.h.) (Offered every quarter)
The problems of income measurement and valuation related to sources and uses of invested capital. *Prereq. 41.501.*

41.503 Accounting Principles III (2 q.h.) (Offered every quarter)
The use of debt and investments in managerial financial decisions, followed by a brief introduction into cost decision analysis. *Prereq. 41.502.*

41.504 Intermediate Accounting I (2 q.h.)
The study of generally accepted accounting principles as applicable to the preparation of financial statements. Accounting for cash, securities, and receivables. *Prereq. 41.503.* (Available on suburban campuses)

41.505 Intermediate Accounting II (2 q.h.)
The use of various systems for accounting for the flow of inventory in a merchandising or manufacturing operation. Long-term investments as a means of providing stability to the concern. *Prereq. 41.504.*

41.506 Intermediate Accounting III (2 q.h.)
The problems of long-term asset acquisition and write-off through depreciation, amortization, and depletion methods. *Prereq. 41.505.*

41.507 Cost Accounting I (2 q.h.)
The foundations of cost accounting, including terminology, purposes, and relationship to financial accounting. *Prereq. 41.503.* (Available on suburban campuses)

41.508 Cost Accounting II (2 q.h.)
The planning and control of current operations through the use of standard costs and budgets. *Prereq. 41.507.*

41.509 Cost Accounting III (2 q.h.)
The use of cost accounting in special decisions and in long-range planning. *Prereq. 41.508.*

41.510 Advanced Accounting I* (2 q.h.)
The accounting problems encountered through the issuance of capital stock, both at issue date and at subsequent dates. *Prereq. 41.506.* (Available on suburban campuses)

41.511 Advanced Accounting II* (2 q.h.)
The techniques of statement analysis, using both internal and external information. A complete examination of cash and fund flow as it is used by the accountant and the analyst. *Prereq. 41.510.*

41.512 Advanced Accounting III* (2 q.h.)
The introduction of special problems posed by partnerships, estates, and trusts. *Prereq. 41.511.*

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*Upper level Business Administration course—see page 57.

41.513 Specialized Problems I* (2 q.h.)
The problems of accounting for special sales. Introduction of the concepts of present value and its use in accounting. *Prereq. 41.512.* (Available at Boston and Burlington)

41.514 Specialized Problems II* (2 q.h.)
The use of consolidated statements in conjunction with newly developing trends toward multi-purpose companies, combinations, mergers, and pools. *Prereq. 41.513.*

41.515 Specialized Problems III* (2 q.h.)
The use of specialized systems and financial statements by companies. *Prereq. 41.514.*

41.516 Auditing I* (2 q.h.)
The examination of modern auditing requirements relative to the professional ethics and legal responsibility of the certified public accountant and the public accountant. *Prereq. 41.512.* (Available at Boston and Burlington)

41.517 Auditing II* (2 q.h.)
The methods and approach used in auditing assets of the firm. *Prereq. 41.516.*

41.518 Auditing III* (2 q.h.)
The methods and approach used in auditing liabilities, owner equity, and nominal accounts of the firm. *Prereq. 41.517.*

41.519 Federal Income Taxes I* (2 q.h.)
The application of the Federal Tax Law to the individual's income, gains, losses, and expenses. *Prereq. 41.515.* (Available at Boston and Burlington)

41.520 Federal Income Taxes II* (2 q.h.)
The application of the Federal Tax Law to the individual's special deductions. Installment sales; income average. *Prereq. 41.519.*

41.521 Federal Income Taxes III* (2 q.h.)
The application of Federal Tax Law to corporations. *Prereq. 41.520.*

41.522 Seminar in Contemporary Accounting Problems* (2 q.h.)
The careful examination of the underlying concepts and conventions of accounting, and their application to financial statements. *Prereq. 41.515, and 41.509.* (Available at Boston and Burlington)

41.523 Seminar in Contemporary Accounting Problems II* (2 q.h.)
The careful examination of the areas of revenue and income recognition, cost determination and allocation, and depreciation. *Prereq. 41.522.*

41.524 Seminar in Contemporary Accounting Problems III* (2 q.h.)
The careful examination of newly developing accounting areas such as pensions, leases, stock options, and business combinations. *Prereq. 41.523.*

41.525 Estate and Gift Taxes* (2 q.h.)
An examination of the relevant Internal Revenue Code provisions, property included in gross estate, including lifetime transfers which remain subject to some control by donor; marital and charitable deductions; administrative expenses; estate planning. *Prereq. 41.521.* (Offered 1976–1977)

41.526 Corporate and Stockholder Tax Problems I* (2 q.h.)
Real estate transactions, stock market options, transfers of appreciated assets to donees, patents, sale of franchise rights, and redemptions of stock in closely held corporations. *Prereq. 41.525.* (Offered 1976–1977)

41.527 Corporate and Stockholder Tax Problems II* (2 q.h.)
Contribution of assets, Section 301 distributions, preferred stock, partial liquidations, spin-offs; collapsible corporations, unreasonable accumulations, personal holding companies, and elements of reorganizations. *Prereq. 41.526.* (Offered 1976–1977)

41.528 Tax Factors in Business Decisions* (2 q.h.)
An examination of the Federal Income Tax consequences of typical business decisions: form of enterprise; compensation policy; capitalization policy; corporate reorganizations, and other related areas. *Prereq. 41.506.* (Offered Fall and Spring Quarters) (Available at Boston and Burlington)

41.533 Accounting for Management Decisions I (non-accounting majors) (2 q.h.)
The preparation and interpretation of financial statements, including cash and fund flow, for internal use by the company. *Prereq. 41.503.* (Available at suburban campuses)

41.534 Accounting for Management Decisions II (non-accounting majors) (2 q.h.)
The preparation and interpretation of cost accounting information. *Prereq. 41.533.*

41.535 Accounting for Management Decisions III (non-accounting majors) (2 q.h.)
The utilization of accounting information for management decisions. *Prereq. 41.534.*

41.541 Accounting Principles (Intensive) (6 q.h.)
Basic concepts and methodology of accounting for service and merchandising businesses. The problems of income measurement and valuation related to sources and uses of invested capital. The use of debt and investments in managerial financial decisions, followed by a brief introduction into cost decision analysis. *(Not open to students who have taken 41.501, 41.502, 41.503.)* (Offered every quarter) (Available at Boston, Burlington, and Weymouth campuses)

41.542 Intermediate Accounting (Intensive) (6 q.h.)
The study of generally accepted accounting principles as applicable to the preparation of financial statements. Accounting for cash, securities, and receivables. The use of various systems for accounting for the flow of inventory in

*Upper level Business Administration course—see page 57.

a merchandising or manufacturing operation. Long-term investments as a means of providing stability to the concern. The problem of long-term asset acquisition of and write-off through depreciation, amortization, and depletion methods. *(Not open to students who have taken 41.504, 41.505, 41.506.) Prereq. 41.503.* (Available at Boston and Burlington)

41.543 Accounting for Management Decisions (Intensive) (non-accounting majors) (6 q.h.)
The preparation and interpretation of financial statements, including cash and fund flow, for internal use by the company. The preparation and interpretation of cost accounting information and the utilization of accounting information for management decisions. *(Not open to students who have taken 41.533, 41.534, 41.535.) Prereq. 41.503.* (Offered Fall Quarter, Boston)

41.551, 41.552 Accounting (A), (B) (6 q.h.)
The basic concepts and methodology of accounting for service and merchandising businesses. The problems of income measurement and valuation related to sources and uses of invested capital. The use of debt and investments in managerial financial decisions, followed by a brief introduction into cost decision analysis. (Offered Fall and Spring Quarters) (Boston only)

41.545 Auditing (Intensive) (6 q.h.)
Same as 41.516, 517, 518. (Not available to students who have completed those courses.) *Prereq. 41.512.* (Available at Boston and Burlington)

41.553 Internal Auditing I (2 q.h.)
Designed to aid in understanding how a modern internal audit function undertakes to review and appraise diverse operations. Studies the audit organization, selection and development of staff preparation of long-range programs, performing preliminary surveys, and developing audit programs. The course is case study oriented. (Offered Boston only)

41.554 Internal Auditing II (2 q.h.)
Techniques of internal audit appraisal are examined. Topics include regression analysis, statistical sampling, computers as an audit tool, auditor responsibilities, and field work. Case studies are employed. *Prereq. 41.553.*

41.555 Internal Auditing III (2 q.h.)
Continuation of the study of internal auditing, emphasizing audit work papers, reports, reviews, replies, and management summaries. Case studies are employed. *Prereq. 41.554.*

43—MARKETING

Consultant: Prof. C. H. Dufton, Chairman, Marketing Dept. (College of Business Administration) 437-3260

Associate Consultant: G. P. Foster, 749-1599

43.501 Introduction to Marketing I (2 q.h.)
A description and evaluation of the marketing system and an introduction to

the decision-making process. (Offered every quarter) (Offered on all campuses)

43.502 Introduction to Marketing II (2 q.h.)
A continuation of Marketing I with emphasis upon specific marketing functions and their application through the use of case studies and analysis. *Prereq. 43.501.* (Offered every quarter)

43.503 Introduction to Marketing III (2 q.h.)
A continuation of the case method plus discussion and analysis of current marketing issues and problems. *Prereq. 43.502.* (Offered every quarter)

43.504 Introduction to Marketing (Intensive) (6 q.h.)
A description and evaluation of the marketing system and an introduction to the decision-making process, with emphasis upon specific marketing functions and their application through the use of case studies and analysis. A continuation of the case method plus discussion and analysis of current marketing issues and problems. *(Not open to students who have taken 43.501, 43.502, 43.503.)* (Offered every quarter) (Available at Boston, Burlington, and Weymouth campuses)

43.505, 43.506 Introduction to Marketing (A), (B) (6 q.h.)
A description and evaluation of the marketing system and an introduction to the decision-making process. A review of specific marketing functions and their application through the use of case studies and analysis. A continuation of the case method plus discussion and analysis of current marketing issues and problems. (Offered Fall Quarter) (Boston only)

43.507 Sales Management I (2 q.h.)
Through readings and case studies, the creation, management, and appraisal of the sales force are examined. In the first quarter of the course, emphasis is upon the principles, policies, and structures of sales organization and the selection of salesmen. *Prereq. 43.503.* (Available on suburban campuses)

43.508 Sales Management II (2 q.h.)
A continuation of 43.507 with emphasis upon sales force operation, including communication, sales training, compensation, expenses, supervision, morale, and stimulation. *Prereq. 43.507.*

43.509 Sales Management III (2 q.h.)
In this concluding quarter of the course, emphasis is upon *sales planning:* market potential, sales forecast, sales budgets, territories, quotas; *sales analysis:* sales volume, marketing cost, performance; and the sales manager. *Prereq. 43.508.*

43.514 Marketing Fundamentals I (Industrial Technology majors only) (2 q.h.)
A description of the role of marketing in the modern business firm and an introduction to basic marketing strategies. (Offered Fall and Winter Quarters) (Available on suburban campuses)

43.515 Marketing Fundamentals II (Industrial Technology majors only) (2 q.h.)
A continuation of Marketing Fundamentals I with emphasis upon specific marketing functions and the evaluation and control of the marketing effort. (Offered Winter and Spring Quarters)

43.518 Retailing and Mass Merchandising I (2 q.h.)
The marketing concept and retail management, retail profit and loss. Starting a retail business, store location, store planning, and the retail organization. (Available on suburban campuses)

43.519 Retailing and Mass Merchandising II (2 q.h.)
Merchandising planning and control, pricing, and buying. *Prereq. 43.518.*

43.522 Retailing and Mass Merchandising III (2 q.h.)
Distribution of merchandise, sales promotion, customers' services, retail accounting, and expense management. *Prereq. 43.519.*

43.520 Industrial Marketing (2 q.h.)
The marketing of products where other business firms and organizations are the customers, including a study of physical distribution, marketing concepts, and the decision-making process relevant to the marketing of business goods. *Prereq. 43.503.* (Offered Fall Quarter)

43.525 Marketing Research I* (2 q.h.)
Introductory presentation and evaluation of procedures and techniques currently available to improve the chances of marketing success and effectiveness. *Prereq. 43.503, 39.513, 45.572.* (Offered Fall Quarter) (Available at Boston and Burlington)

43.526 Marketing Research II* (2 q.h.)
Modern techniques of data collection and analysis, both quantitative and qualitative, in marketing research, forecasting, product planning, test marketing, marketing evaluation, and the application of modern data-processing techniques. *Prereq. 43.525.* (Offered Winter Quarter)

43.529 International Marketing (2 q.h.)
Opportunities, methods, and policies required for the successful development and management of international business and marketing operation. *Prereq. 43.503.* (Offered Winter Quarter)

43.530 Consumer Behavior Seminar (2 q.h.)
Economic, behavioral, and other models of consumer behavior are examined as bases for the planning and evaluation of marketing effort. *Prereq. 43.503.* (Offered Spring Quarter)

43.532 Marketing Management I* (2 q.h.)
Advanced management and decision-making covering the complete marketing spectrum are analyzed in a variety of case studies and problems. *Prereq. 43.503.*

43.533 Marketing Management II* (2 q.h.)
Using a seminar-type approach, emphasis is placed upon problem-solving in such areas as sales, logistics and physical distribution, advertising, pricing, new development, public and governmental policy. *Prereq. 43.532.*

43.534 Marketing Management III* (2 q.h.)
A continuation of Marketing Management II, with increased emphasis upon case analysis and study. *Prereq. 43.533.*

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*Upper level Business Administration course—see page 57.

43.536 Introduction to Advertising (2 q.h.)
A broad survey of advertising and how it contributes to business activity, and to our society and culture, with emphasis on the principles involved in its increasing importance as a major form of communications and motivation. (Offered Spring Quarter)

43.537 Marketing and Sales Seminar* (2 q.h.)
A one-quarter, capstone course to round out the student's study of marketing through investigation and analysis of the most recent trends in marketing management, finance, logistics, sales, advertising, and promotion. *Prereq. 43.534.* (Offered Spring Quarter) (Available at Boston and Burlington)

43.541 Public Relations I (2 q.h.)
Introduction to the basic principles, purposes, and methods of public relations. *Prereq. 43.503.* (Offered Fall Quarter)

43.542 Public Relations II (2 q.h.)
A continuation of Public Relations I providing in-depth coverage of the planning, management, operation, and evaluation of public relations programs, including case analysis. *Prereq. 43.541.* (Offered Winter Quarter)

43.543 Salesmanship I (2 q.h.)
Opportunities in personal selling for both men and women; the importance in the marketing mix; introduction to broadly applicable principles for all types of selling. *Prereq. 43.503.* (Offered Fall Quarter)

43.544 Salesmanship II (2 q.h.)
Development of techniques as required for the personal selling of goods and services through middlemen and direct to the consumer. Both industrial and consumer channels are studied. *Prereq. 43.543.* (Offered Winter Quarter)

43.545 Product Management and Development (2 q.h.)
An analysis of the problems present in managing and directing product development activities. Presents current trends and concepts in new product planning, development, improvement, evaluation, and marketing. Both consumer and industrial products will be studied. *Prereq. 43.503.* (Offered Fall and Spring Quarters) (Available at Boston and Burlington)

43.546 Advertising and Sales Promotion Management I* (2 q.h.)
The principles of advertising and sales promotion and how they are used with maximum efficiency as communications and motivational functions of the marketing mix. (Formerly 43.511) *Prereq. 43.503.* (Available on suburban campuses)

43.547 Advertising and Sales Promotion Management II* (2 q.h.)
A study of specific advertising and sales promotion techniques in various media, with emphasis on the development of creative concepts as an important part of sales and marketing strategy. (Formerly 43.512) *Prereq. 43.546.*

43.548 Advertising and Sales Promotion Management III* (2 q.h.)
Case histories and contemporary projects are used for improving ability to develop creative advertising and sales promotion strategies in support of overall sales and marketing goals. (Formerly 43.513) *Prereq. 43.547.*

49.506 Consumer Education (2 q.h.)
The development of knowledge and skills involved in the daily life and economic welfare of the consumer and consumer groups, including competency in managing money; purchasing and using goods and services; banking; investments; credit; consumer legislation; evaluation of consumer research and product testing; and the role of the consumer in the economy. (Offered Fall and Spring Quarters)

44—FINANCE AND INSURANCE

Finance

Consultant: Prof. R. J. Hehre (College of Business Administration) 432-3248
Coordinator: W. F. Hancock, Jr.

44.501 Finance and Risk Management I (2 q.h.)
A survey of major financial institutions and their role within the economy. Special emphasis is given to the dollar supply, commercial banking, the Federal Reserve System, and savings institutions. *Prereq. 41.503.* (Offered every quarter) (Available on all campuses)

44.502 Finance and Risk Management II (2 q.h.)
A study of security markets and investment institutions. The student is introduced to stocks, bonds, investment companies, and trust companies. (Offered every quarter)

44.503 Finance and Risk Management III (2 q.h.)
This course is intended to acquaint each student with personal property and liability risks, and the forms of insurance designed to meet these risks. The emphasis is placed on basic insurance principles inherent in life, homeowners, and automobile coverage. (Offered every quarter)

44.504 Finance and Risk Management (Intensive) (6 q.h.)
Same as 44.501, 44.502 and 44.503. *(Not open to students who have taken those courses.)* (Offered Fall and Winter Quarters) (Available at Boston and Burlington)

44.505 Corporate Finance (Intensive) (6 q.h.)
An introduction to the role of financial management of the business firm. Review of financial statements, promotion, and forms of organization. Planning the use of assets and cost of capital concepts are introduced as management evaluation techniques. An analytical approach to capital budgeting and optimum asset returns. Cost of capital is further developed and applied against consideration of capital mixture. The analysis of various financial tools are considered.

An intensive examination of short- and intermediate-term credit, as well as the distribution of stocks and bonds to the public and special buyers. A survey of reorganization and liquidation techniques are analyzed. (Not open to students who have taken 44.507, 44.508, 44.509.) *Prereq.* 44.501. (Offered Winter and Spring Quarters) (Available at Boston and Burlington)

44.507 Corporate Finance I (2 q.h.)
An introduction to the role of financial management of the business firm. Review of financial statements, promotion, and forms of organization. Planning the use of assets and cost of capital concepts are introduced as management evaluation techniques. *Prereq. 41.503, 44.501.* (Available at all campuses)

44.508 Corporate Finance II (2 q.h.)
An analytical approach to capital budgeting and optimum asset returns. Cost of capital is further developed and applied against consideration of capital mixture. *Prereq. 44.507.*

44.509 Corporate Finance III (2 q.h.)
The analysis of various financial tools are considered. An intensive examination of short- and intermediate-term credit, as well as the distribution of stocks and bonds to the public and special buyers. A survey of reorganization and liquidation techniques are analyzed. *Prereq. 44.508.*

44.517 Investments I* (2 q.h.)
Investment goals and objectives are considered. Various types of investments are compared and the role of the securities markets examined. *Prereq. 44.509.* (Available at suburban campuses)

44.518 Investments II* (2 q.h.)
Broad coverage of the relationship between the economy and stock price averages. Methods of analyzing and appraising developments within the corporation as they apply to the investment analyst's techniques. *Prereq. 44.517.*

44.519 Investments III* (2 q.h.)
The relation of earnings, dividends, and cash flow to market valuation of a company's securities. Portfolio analysis and planning are examined, as well as methods of security selection. Technical and fundamental factors are also considered. *Prereq. 44.518.*

44.521 Credit Management I* (2 q.h.)
An introduction to credit and its functions, including the role of the credit executive, credit investigation, documentary credit, trade credit. *Prereq. 44.509.* (Available at Boston and Burlington)

44.522 Credit Management II* (2 q.h.)
The organization and function of credit departments; various forms of credit and collection services. *Prereq. 44.521.*

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*Upper level Business Administration course—see page 57.

4.523 Credit Management III* (2 q.h.)
Analysis of financial statements to determine credit worthiness, creditor's rights, adjustment bureau, credit insurance, and guarantees. *Prereq. 44.522.*

4.531, 44.532 Seminar in Finance I, II* (4 q.h.)
Student participation in the study and analysis of case histories. Individual papers presented. *Prereq. All finance courses.* (Offered Fall and Winter Quarters)

4.533 International Finance I (2 q.h.)
Introduction to international financial management in the multi-national corporation. Analysis of the basic problems and finance considerations involved with international investments, trade, and payments. Planning in the international environment related to exchange rates, currency revaluations, inflation, and local government policies. *Prereq. 44.507 or consent of instructor.* (Offered Fall Quarter) (Available at Boston and Burlington)

4.534 International Finance II (2 q.h.)
Analysis of the financial strategy involved with international investment alternatives, sources of capital, working capital management, fund flows, and management control through accounting and financial reporting. *Prereq. 44.533.* (Offered Winter Quarter)

4.535 Investments (Intensive) (6 q.h.)
Investment goals and objectives are considered. Various types of investments are compared and the role of the securities markets examined. Broad coverage of the relationship between the economy and stock price averages. Methods of analyzing and appraising developments within the corporation as they apply to the investment analyst's techniques. The relation of earnings, dividends, and cash flow to market valuation of a company's securities. Portfolio analysis and planning are examined, as well as methods of security selection. Technical and fundamental factors are also considered. *(Not open to students who have taken 44.517, 44.518, 44.519.) Prereq. 44.509.* (Offered Spring Quarter) (Available at Boston and Burlington)

4.544 Law of Finance* (2 q.h.)
A consideration of the legal problems immediately affecting finance. Special attention is given to the field of corporate law. *Prereq. 44.509, 45.543.* (No longer offered)

4.545 Profit Planning and Control I* (2 q.h.)
An intensive treatment of managerial planning, budgetary control, and financial analysis. Emphasis is placed on the interrelationship between functional areas in an organization using consolidated profit planning as an integrating device. Students will utilize materials studied in earlier courses. Topics covered include fundamental financial analysis, comprehensive profit planning and control, general expense planning and control, production planning, materials planning and control, purchasing direct, etc. *Prereq. 41.506, 44.509 or equiv.* (Offered Fall Quarter)

*Upper level Business Administration course—see page 57.

44.546 Profit Planning and Control II* (2 q.h.)
Topics covered include development and application of variable budgets, planning and controlling capital expenditures, computer applications in profit planning, cash flow planning and control, cost-profit-volume analysis, performance reporting and analysis of budget variations. *Prereq. 44.545.* (Offered Winter Quarter)

44.547 Advanced Financial Problems* (2 q.h.)
An in-depth examination of two complex but vital financial areas. Failure and reorganization, and merger and consolidation. Students will devote considerable time to studying the legal relationships and requirements of both areas and their business implications. *Prereq. 44.509 or equiv.* (Offered Spring Quarter)

44.548 Capital Strategy* (2 q.h.)
Focuses on the matters of capital budgeting and the related capital structure problems with particular emphasis on the role of the cost of capital in long-range decision-making. The processes by which investment decisions and financing decisions are made as well as sources of long-term funds are examined. (Offered Spring Quarter)

44.550, 44.551 Personal Finance I, II (4 q.h.)
(Recommended for all non-Finance majors.) Course takes a practical approach to problems of managing personal finances. Topics include financial planning, budgeting, obtaining credit and loans, income taxes, savings and investments, life insurance, home buying, and estate planning. Subjects are treated on a non-technical basis. (Offered Fall and Winter Quarters) (Available at all campuses)

44.552 Personal Finance (Intensive) (4 q.h.)
Same as 44.550 and 44.551. (Offered Fall, Winter, and Spring Quarters) (Available in Boston only)

44.553 New Venture Financing (2 q.h.)
Designed to assist the entrepreneur in establishing and financing his own business. Particular problems of small business finance as well as the expansion of established and growing businesses are given close attention. Methods of raising and safeguarding capital and the practical management of new business financial problems are covered as well. Field work and guest lecturers are featured wherever practical. *Prereq. 44.509.* (Offered Spring Quarter) (Available in Boston only)

44.554, 44.555 Savings Banks and Banking I, II (4 q.h.)
A professional course in the management of institutions involved in the channeling of savings into investments. Investment and loan practices are covered in detail, as well as such topics as community relations, deposit attraction programs, and personnel management. *Prereq. 44.509.* (Offered Fall and Winter Quarters) (Available in Boston only)

44.556, 44.557 Commercial Banks and Banking I, II (4 q.h.)
A professional-level course in the management of commercial banks designed for students currently in or desiring to enter the commercial banking field.

Course concentrates on the efficient management of bank assets, including bank liquidity, capital adequacy, investment and loan portfolio management, bank audit and control, and community relations. *Prereq. 44.509.* (Offered Fall and Winter Quarters) (Available in Boston only)

Insurance

44.511 Life Insurance I (2 q.h.)
A study of the origin, development, and basis of modern life insurance. Analysis and comparison of the various policies and riders and their uses. (Offered Fall Quarter) (Available at Boston and Burlington)

44.512 Life Insurance II (2 q.h.)
The fundamentals of programming, including beneficiary designations, settlement options, and tax implications. Company organization and operations: underwriting, investments, and regulations. (Offered Winter Quarter)

44.513 Estate Planning and Business Insurance (2 q.h.)
The use of insurance to meet the needs of the various types of business organizations. The planning, disposition, administration, and taxation of testamentary and intervivos transfers of property. (Offered Spring Quarter) (Available at Boston and Burlington)

44.514 Property and Casualty Insurance I (2 q.h.)
The basis of modern property-casualty insurance. Analysis of the insurance contract, its application, meaning, and rating. (Available at Boston and Burlington)

44.515 Property and Casualty Insurance II (2 q.h.)
Study of various policies including automobile, homeowners, inland marine, and commercial special multi-peril. *Prereq. 44.514.*

44.516 Property and Casualty Insurance III (2 q.h.)
A study of the mechanics of the insurance industry, including types of companies, reserves, reinsurance, financial analysis, and government regulation. *Prereq. 44.515.*

44.525 Health and Social Insurance I* (2 q.h.)
A study of the economic basis served by health and social programs of insurance, including a detailed analysis and comparison of the plans offered. (Offered Fall Quarter) (Available at Boston)

44.526 Health and Social Insurance II* (2 q.h.)
A continuing study of contracts, including benefit structure, rate-making, reserves, and the proper use and coordination of the plans available from private industry and from the government. *Prereq. 44.525.* (Offered Winter Quarter)

44.527 Group Insurance and Pensions (2 q.h.)
The nature, development, and coverage offered by group life and health insur-

*Upper level Business Administration course—see page 57.

ance. Analysis of the various kinds of individual and group pension plans and their use. (Offered Spring Quarter) (Available at Boston)

44.529 Advanced Property Insurance* (2 q.h.)
A study of the plans and programs designed to provide protection for multi-peril, diversified industrial, and commercial organizations. *Prereq. 44.515.* (Offered in Fall Quarter) (Available at Boston only)

44.530 Advanced Property-Casualty Insurance* (2 q.h.)
A study of the various plans and programs for providing liability and casualty protection for commercial and industrial organizations. *Prereq. 44.515.* (Offered Winter Quarter) (Available at Boston only)

44.543 Law of Insurance* (2 q.h.)
A study of the legal problems affecting insurance, including regulation design and interpretation of contracts and the relationship between the insurance company, its agent, and the public. *Prereq. 45.543.* (Offered Spring Quarter) (Available at Boston only)

45—MANAGEMENT

General Management

Consultant: Prof. D. McCarthy (College of Business Administration) 437-3256
Coordinator: J. L. Griffith 843-6209
Coordinator: W. A. Gagne 647-2121

45.501, 45.502, 45.503 Management and Organization I, II, III (6 q.h.)
An introduction to the American business system; comparison with other economic systems; principles and concepts of organization and management. Emphasis on topics such as the social responsibilities of business; business and its environment; business ethics, etc. Traditional material presented toward an understanding of modern American business and preparation for a business career. The environment within which business operates; a review of the theory and practice of organization; the "what" and "how" of the management process; an application of the concepts covered to the functional areas of business. *Prereq. 45.502, 45.503.* (Offered every quarter) (Available on all campuses)

45.652 Management and Organization (Intensive) (6 q.h.)
Same as 45.501, 45.502, 45.503. *(Not open to students who have completed those courses.)* (Offered every quarter) (Available at Boston, Burlington, and Weymouth)

45.523, 45.524, 45.525 Management Seminar I, II, III* (6 q.h.)
A broad interdisciplinary project utilizing one or more of the techniques of library research, field research, field surveys and organizational audits. Students will be expected to utilize the knowledge gained in earlier course work. *Prereq. 45.535.* (Available at Boston and Burlington)

*Upper level Business Administration course—see page 57.

45.533, 45.534, 45.535 Management Decisions and Policies I, II, III (6 q.h.)
Takes the viewpoint of the general manager in planning effective relationships between the organization and its environment. Emphasis placed on sensing, analyzing, evaluating, and responding to demographic, cultural, political and technological change. Functions and responsibilities of top management; problems which affect the character and success of the total enterprise; operations in various environments and the impact of government regulations. A framework will be developed for dealing with a total organization evolving or modifying strategies and policy. Cases are drawn from profit-oriented and non-profit entities of various sizes in widely diversified fields, operating in a variety of environments. Students will be expected to actively participate in class discussions of case studies. *Prereq. minimum of 100 quarter hours of completed course work.* (Available at Boston, Burlington, and Norwood)

45.600, 45.601, 45.602 Small Business Management I, II, III (6 q.h.)
For those who wish to explore the opportunities of being in a small business or in business for themselves. Subjects considered include objective self-analysis; discovery of opportunities in the manufacturing, retailing and service fields; raising and conservation of capital; organization and site location factors; management controls in relation to legal, financial, personnel, and marketing problems. (Available at Boston and Burlington)

45.603 Administrative Management and Office Services I (2 q.h.)
Principles and techniques of modern administrative management including organization, planning, office mechanization, computers, information requirements analysis, and the conducting of a systems study. (Offered Fall Quarter) (Available at Boston only)

45.604 Administrative Management and Office Services II (2 q.h.)
An analysis of systems and procedures, business writing, report structuring, records management, control techniques, staffing, and methods of directing the administrative management function. *Prereq. 45.603.* (Offered Winter Quarter) (Available at Boston only)

45.606 Management Decisions and Policies (Intensive)* (6 q.h.)
Same as 45.533, 45.534, 45.535, except presented twice per week during a single quarter. *Prereq. Minimum of 100 quarter hours of completed course work.* (Offered Summer Quarter)

45.646 Management Seminar (Intensive)* (6 q.h.)
Same as 45.523, 45.524, 45.525, except presented as a single-quarter intensive course. *(Not open to students who have taken 45.523, 524, 525.) Prereq. 45.535.* (No longer offered)

45.667 Project Planning and Control (2 q.h.)
This course employs a systems approach to planning and controlling a work project. Topics to be covered include detailed planning techniques, establishment of functional and individual responsibilities, resource allocation, identifying anticipated benefits, measuring results and effective progress reporting. Students will be expected to actively participate in class workshop sessions.

*Upper level Business Administration course—see page 57.

Prereq. Minimum of 40 quarter hours of completed work. (Offered every quarter) (Available at all campuses)

45.670, 45.671, 45.672 Management of Change I, II, III (6 q.h.)
Traditional concepts of management are reexamined in light of current changes in employee attitudes, material, energy and capital shortages, consumer protection interests, unemployment and inflation problems, and government reactions. Selected cases of reaction to change by business organizations as reported in current business publications are studied. Students are expected to identify changes that call for new management strategy and to evaluate actions taken by the firms studied. Further, the student will be expected to reevaluate his own career goals in relation to the changing world of business, and to restructure those goals accordingly. *Prereq. 45.503.* (Available at Boston only)

45.696 Principles and Practice of Management (2 q.h.)
Considers management as a process engaged in various levels of any organization, and investigates fundamental principles which are generally accepted as the foundation of management action. Included among other topics are those of planning, organizational considerations, and directing and controlling an organization. Application of generally accepted principles are considered through investigation of management practice in organizational settings. (Offered every quarter) (Available at Boston, Burlington, Framingham, and Weymouth)

49.504 Strategy for Planning I (3 q.h.)
Students participate as team members in a computerized decision-making exercise. Course materials, class discussions, and guest lecturers will expose the student to planning techniques, systems, and issues with which executive management becomes involved. Each class member is provided with an opportunity to use a full range of skills and experience to make key decisions in planning and operating a company in an uncertain, competitive environment. *Prereq. Minimum of 100 quarter hours of completed work. 45.535 recommended.* (Offered Fall and Winter Quarters) (Available at Boston only)

49.505 Strategy for Planning II (3 q.h.)
A continuation of 49.504. Students will have continued opportunities to analyze results of previous decision-making, engage in additional planning and decision-making, and conduct board meetings. *Prereq. 49.504.* (Offered Winter and Spring Quarters) (Available at Boston only.)

Industrial Management Courses

Consultant: J. M. Rosenfeld 969-4783

45.506 Production Management and Manufacturing Systems I (2 q.h.)
Analysis of the basic areas of production management, characteristic organizations, activities, responsibilities, and decision-making. The systems concept as applied to manufacturing. Manufacturing costs and their management. (Available at all campuses)

45.507 Production Management and Manufacturing Systems II (2 q.h.)
Further analysis of the manufacturing system, including production control,

materials, work design, simplification and measurement; quality control; data processing as applied to manufacturing; selected readings in modern production management techniques. *Prereq. 45.506.* (Available at all campuses)

45.508 Production Management and Manufacturing Systems III (2 q.h.)
Continuing study and analysis of the manufacturing function; production and process technology; workplace methods and standards; planning and control of operations and inventories: concepts, analytical techniques and information systems; selected case studies emphasizing relevant production management and manufacturing systems, concepts and applications. *Prereq. 45.507.* (Available at all campuses)

45.519 Work Methods (2 q.h.)
The principles of motion economy and work simplification in analysis and improvement of methods, utilizing flow charts, diagrams, work station activity charts, and laboratory techniques. (Offered Fall Quarter) (Available at Boston only)

45.526 Facilities Planning and Design I (2 q.h.)
The planning and designing of industrial plants, in terms of equipment and machinery requirements, plant layout and material flow, utilizing flow charting, scheduling, and laboratory scale models. *Prereq. 45.508.* (Offered Fall Quarter) (Available at Boston only)

45.531 Facilities Planning and Design II (2 q.h.)
The fundamentals of material handling and related equipments, vehicles, and machinery, including cranes, conveyors, freight elevators, and monorails, with emphasis on analysis of problems, typical cases, and costs, and including engineering economy. *Prereq. 45.526.* (Offered Winter Quarter) (Available at Boston only)

45.528 Work Measurement (2 q.h.)
Measurement techniques as applied to development of production and wage standard data, including appropriate incentive plans and directed towards quantity manufacturing, with laboratory use. (Offered Winter Quarter) (Available at Boston only)

45.530 Standard Data Development (2 q.h.)
Development of production standards for job shop operations, applying curve, table, equation, nomograph, family and multivariables techniques, and utilizing work sampling methods and laboratory practice. (Offered Spring Quarter) (Available at Boston only)

45.595 Manufacturing Seminar I* (2 q.h.)
Problems of manufacturing operation at the plant manager level, including production economics of specialization, simplification, standardization, diversification, expansion, contraction, or integration, all with pertinent, selected case studies. *Prereq. 45.625 & 45.637.* (Available at Boston only)

45.596 Manufacturing Seminar II* (2 q.h.)
Continued analysis of manufacturing problems, including plant location, layout,

*Upper level Business Administration course—see page 57.

materials handling, power maintenance, labor market status, organization and wage policy, all with pertinent, selected case studies. *Prereq. 45.595.* (Available at Boston only)

45.597 Manufacturing Seminar III* (2 q.h.)
Continued analysis of manufacturing problems, including controls of the manufacturing process; product design and development, scheduling, inventory, quality, cost and budgetary controls with applicable cases. *Prereq. 45.596.* (Available at Boston only)

45.620 Industrial Safety (2 q.h.)
A study of the organization and administration of a comprehensive accident-prevention program, including analysis of industrial hazards and accidents, corrective actions, and the responsibilities of all management echelons, from the safety engineer to top management. (Offered Fall and Spring Quarters) (Available at Boston only)

45.623 Manufacturing Processes I—Material (2 q.h.)
Materials and their processing, including the derivation, characteristics, and applications of materials used in industry, such as ferrous, non-ferrous metals, plastics, their mechanical, thermal, electrical, chemical, and other properties with an analysis of applications to manufacturing. (Available at most campuses)

45.624 Manufacturing Processes II—Production (2 q.h.)
Machinery, welding, and allied processing, including an analysis of product design. Production processes and material selection in the production and manufacturing of hard goods, including selection of best methods by study of casting, machinery, forming, joining, hot and cold locking, extrusion, finishing, and assembly. *Prereq. 45.623.* (Available at most campuses)

45.625 Manufacturing Processes III—Automation (2 q.h.)
The analysis of advanced manufacturing processes, including mass production, numeric control, central vs line layout systems, automated systems and related problems, computer controlled equipment and systems, equipment and machinery selection and replacement policies. Emphasis on manufacturing processes case studies. *Prereq. 45.624.* (Available at most campuses)

45.627, 45.628 Value Management I, II (4 q.h.)
An organized technique for challenging costs by analyzing a product or method in terms of value, function, costs, without sacrificing essential quality. (Offered Fall Quarter) (Available at Boston and Burlington)

45.636 Production and Inventory Control I (2 q.h.)
Basic analysis and systems design techniques for controlling production. Aspects of intermittent and continuous production scheduling and the relationship of planning, scheduling and dispatching, and utilizing mathematical models. Scheduling techniques of PERT, CPM, line of balance, and learning curves. Field trip to local company and examination of its production control system. (Offered Fall and Winter Quarters) (Available at Burlington, Weymouth, Norwood, and Revere)

*Upper level Business Administration course—see page 57.

45.637 Production and Inventory Control II (2 q.h.)
Analysis and systems design techniques for controlling inventory levels emphasizing cost reduction, including inventory investment, economic order quantity, make or buy decisions, and warehousing. Goals include bringing the range of concept and technique to the point of useful application in practical design. *Prereq. 45.636.* (Offered Winter and Spring Quarters) (Available at Burlington, Weymouth, Norwood, and Revere)

45.638 Industrial Decision Making I* (2 q.h.)
The development of a systematic approach to problem solving and decision making; decision theory; structure of human decisions. *Prereq. 10.334.* (Available at Boston only)

45.639 Industrial Decision Making II* (2 q.h.)
Application of mathematical methods of management science and quantitative decision-making procedures to practical industrial problems; optimization and models applied to production functions such as the inventory process, plant location, layout and maintenance, and equipment selection, replacement, and maintenance. *Prereq. 45.638.* (Available at Boston only)

45.640 Industrial Decision Making III* (2 q.h.)
Application of mathematical methods of management science and quantitative decision-making procedures to practical industrial problems, including linear systems utilizations and functional production applications such as: economic lot size, optimal machine loading, production, and employment scheduling; seasonal inventory distribution; transportation and transshipment models; maximum profit margin; methods improvements; selected case studies. *Prereq. 45.639.* (Available at Boston only)

45.642 Production Management and Manufacturing Systems (Intensive) (6 q.h.)
Same as 45.506, 45.507, 45.508. *(Not open to students who have completed those courses.)* (Offered every quarter) (Available at Boston, Burlington, and Weymouth)

45.673 Industrial Processes I (2 q.h.)
Familiarizes the Industrial Technology student with the materials and processes used in manufacturing to convert ideas into products, machines and structures; characteristics and applications of materials used in industry; casting and forming processes; machining processes. *(Open to Industrial Technology students only.)* (Offered every quarter) (Available at most campuses)

45.674 Industrial Processes II (2 q.h.)
Continued analysis of manufacturing processes including welding and allied processes; machine tools: advantages and limitations; economic analysis of manufacturing processes; automated and computer controlled systems; equipment and machinery selection and replacement policies. *Prereq. 45.673.* (Offered every quarter) (Available at most campuses)

45.688 Production and Inventory Control (Intensive) (4 q.h.)
Same as 45.636, 45.637. *(Not open to students who have completed those*

*Upper level Business Administration course—see page 57.

courses.) (Offered every quarter) (Available at Boston and Burlington)

45.695 Materials Management (2 q.h.)
The development and examination of materials management objectives as they relate to cost improvement, investment control, and ability to serve the market; the development of an integrated materials system; cases in materials management. (Offered every quarter) (Available at Boston and Burlington)

49.501 Environmental Management I (2 q.h.)
The state of our environment now and in the future—an introduction to the types and threats of pollution, including the atmosphere, land, and waterways. Emphasis placed on impact of pollution upon economic growth, business profitability, governmental outlays, and individual expenditures. Lectures, class participation, and selected readings. Written reports required. (Offered 1976–1977)

49.502 Environmental Management II (2 q.h.)
A continuation of Environmental Management I in which the level of our technology is explored. A review of control techniques, disposal systems and purification equipment with an evaluation of their effectiveness and costs. Critical unsolved technical problems and the needs for scientific investigation will be highlighted. Lectures, class participation, and selected readings. Written reports required. *Prereq. 49.501.* (Offered 1976–1977)

49.503 Environmental Management III (2 q.h.)
A continuation of Environmental Management II in which past, present, and future controlling and corrective actions of business and government and the individual are examined. Evaluation of the balance between responsible self control and preventive legislation. Specific attention to the complexity of interacting factors and the dilemma of productivity demands versus the environmental limitations of adaptability. Lectures, class participation, and selected readings. Written reports required. *Prereq. 49.502.* (Offered 1976–1977)

Purchasing

Coordinator: Mr. A. D. Finley 475-6172

45.537 Purchasing I (2 q.h.)
The span of responsibilities; its objectives, organization, and personnel requirements. Systems and operational flow with current techniques. The interface with EDP. The acquisition of correct quality levels. Developing sources of supply. (Available at most campuses)

45.538 Purchasing II (2 q.h.)
Planning materials acquisition to optimize inventory investment. Controlling the aspects of price. The "make or buy" decision. The functions of planning, forecasting, and special project research. The application of standardization and value analysis/engineering principles. *Prereq. 45.537.* (Available at most campuses)

45.539 Purchasing III (2 q.h.)
The art and techniques of negotiation. Purchasing capital equipment, materials

budgeting. Major policy considerations. Supplier relations and ethical behavior profiles. The impact of law and its constraints. Evaluating purchasing performance. *Prereq. 45.538.* (Available at most campuses)

45.550 Purchasing (Intensive) (6 q.h.)
Same as 45.537, 45.538, 45.539. (Offered Fall Quarter) (Available at Boston only)

45.626 Professional Purchasing Techniques* (2 q.h.)
A seminar-type examination of methods of negotiation, use of contract types and incentives which yield improved buyer performance. Price analysis and the development of supplier monitoring and control techniques. *Prereq. 45.539.* (Offered Spring Quarter) (Available at Boston, Burlington, Weymouth, and Milford)

45.666 The Materials Acquisition Function (2 q.h.)
A survey of the procurement function as found in industry. This course is designed to furnish candidates, with majors in other than purchasing, a broad comprehension of the acquisition function. Purchasing's mission, procedures, proper interface with other functions, and its legitimate objectives are explored. System techniques, organizational structures and required skills are investigated and particular attention is given to the integration of this function into the total cycle of product creation. (Offered Fall and Spring Quarters) (Available at Boston and Burlington)

Personnel & Industrial Relations

Consultant: Professor Christine L. Hobart 437-3252
Associate Consultant: (Industrial Labor Relations) Mr. D. F. Hurley 785-0484

45.545 Law Employment Standards* (2 q.h.)
The minimum wage laws—state and federal—and laws on employment practices, administrative and enforcement procedures, employment provisions of the 1964 Civil Rights Act, and of state anti-discrimination laws. *Prereq. 45.611.* (Offered in Fall Quarter) (Available at Boston only)

45.546 Law of Employment Conditions* (2 q.h.)
The Labor Management Reporting and Disclosure Act, the Social Security Act, The Massachusetts Employment Security Act. The Massachusetts Workmen's Compensation Act, veterans' reemployment rights. *Prereq. 45.611.* (Offered Winter Quarter) (Available at Boston only)

45.548 Law of Labor Management Relations* (2 q.h.)
The legal framework for collective bargaining, the impact of the anti-trust laws on labor unions, injunctions in labor disputes, the Railway Labor Act, the National Labor Relations Act, the Labor-Management Relations Act. *Prereq. 45.611.* (Offered Spring Quarter) (Available at all campuses)

45.553 The Labor Agreement* (2 q.h.)
Labor contracts: component clauses, grievance analysis, and arbitration procedures. Case studies in labor-management relations affected by such clauses.

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Prereq. 45.611 (Offered Fall Quarter) (Available at Boston, Burlington, and Framingham)

45.556 Negotiations, Mediation, Arbitration* (2 q.h.)
The bargaining process; preparation and negotiation of agreements; mediation, fact-finding, arbitration, other alternatives to the strike. *Prereq. 45.611.* (Offered Winter Quarter) (Available at Boston, Burlington, and Framingham)

45.560 Seminar on Labor Issues* (2 q.h.) (For Seniors only)
An advanced discussion of current labor-management issues; policy as to disputes, wage guidelines, public employees' unions, professionals, etc. *Prereq 45.546, 45.548, 45.553.* (Offered Spring Quarter) (Available at Boston, Burlington and Framingham)

45.610 Labor Management Relations I (2 q.h.)
The American labor movement and labor relations development; collective bargaining issues, policy and practice; public control of industrial relations *Prereq. 39.503.* (Offered every quarter) (Available at all campuses)

45.611 Labor Management Relations II (2 q.h.)
Continuation of Part I. The economic and political impact of bargaining power on labor markets, employment, wages, and income. *Prereq. 45.610.* (Offered every quarter) (Available at all campuses)

45.690 Labor Management Relations (Intensive) (4 q.h.)
The American labor movement and labor relations development; collective bargaining issues, policy, and practice; public control of industrial relations The economic and political impact of bargaining power on labor markets, employment, wages, and income. *Prereq. 39.503. (Not open to students who have taken 45.610, 45.611.)* (Offered every quarter) (Available at Boston, Burlington and Weymouth)

49.539 International Labor Relations (2 q.h.)
A survey of union-employee relations on the international level with specific reference to Western Europe, Japan, Australia, and Mexico. An examination of the legal structure, the structure of unions, the organization of both employers and unions for collective bargaining, and the impact on major economic or governmental policies. Replaces course 45.557. (Offered Fall Quarter) Available at Boston only)

Personnel

Coordinator: Mr. Ronald E. Guittarr 475-5000
(Personnel Relations)

45.511, 45.512 Human Relations in Organizations I, II (4 q.h.)
The first quarter emphasizes the expanding popularity of human relations, describing participation, formal and informal organizational concepts, and leadership patterns. The second quarter provides a review of the processes of communication, appraisal of performance, and accomplishment of change. Classes are highly participative, with emphasis on case discussion as related to text materials. (Offered every quarter) (Available at all campuses)

*Upper level Business Administration course—see page 57.

45.552 Advanced Human Relations (2 q.h.)
A seminar to discuss the theories of human effectiveness. An amplification of topics surveyed in Human Relations I, II, emphasizing their practical application to present-day management of business enterprises. Review implications of such theories as the managerial grid, theory X, Y, maintenance vs motivation, etc. *Prereq. 45.512.* (Offered every quarter) (Available at all campuses)

45.513 Personnel Management I (2 q.h.)
Organization, function, and procedures of the personnel department in relationship to the management organization; manpower selection; training; rating; personnel policies, benefits, and reports. (Available at all campuses)

45.514 Personnel Management II (2 q.h.)
Principles and techniques of training, the psychology of learning, meeting training needs, principles and practices of organizing training activities. *Prereq. 45.513.* (Available at all campuses)

45.515 Personnel Management III (2 q.h.)
Controlling and coordinating the managerial responsibility of supervision; planning the work; employee assignments; employee attitudes; employee grievances; administering company policies, developing work interest. *Prereq. 45.514.* (Available at all campuses)

45.517 Techniques of Employee Selection* (2 q.h.)
Recruitment, selection, and placement techniques including interviewing, employment testing, and examining. *Prereq. 45.515.* (Offered Spring Quarter) (Available at Boston and Burlington)

45.518 Wage and Salary Administration* (2 q.h.)
Wage and salary determination; merit and incentive plans; wage and salary structure; compensation methods; impact on employer-employee relations in the economy. *Prereq. 39.503, 45.503.* (Offered in Fall Quarter) (Available at Boston and Burlington)

45.521 Employee Benefits* (2 q.h.)
Private and public programs directed to job and worker income security; unemployment compensation, training and employment services; private guaranteed income: retirement pension plans and disability; group insurance. *Prereq. 39.503.* (Offered Winter Quarter) (Available at Boston and Burlington)

45.522 Job Evaluation (2 q.h.)
Wage-payment systems; theory of wage determination, job elements, rating scales, writing job descriptions and specifications; selection of plans; development of wage structures and integration with the principles of merit rating. (Offered Fall Quarter) (Available at Boston and Burlington)

45.607 Personnel Management (Intensive) (6 q.h.)
Organization, function, and procedures of the personnel department in relationship to the management organization; manpower selection; training; rating; per-

*Upper level Business Administration course—see page 57.

sonnel policies, benefits, and reports. Principles and techniques of training; the psychology of learning; meeting training needs; principles and practices; organizing training activities. Controlling and coordinating the managerial responsibility of supervision; planning the work; employee assignments; employees attitudes; employee grievances; administering company policies, developing work interest. *(Not open to students who have taken 45.513, 45.514, 45.515.)* (Offered every quarter) (Available at Boston, Burlington, and Weymouth)

45.641 Human Relations in Organizations (Intensive) (4 q.h.)
An introduction to human problems of the work environment: motivation, employee participation, formal and informal organizations, and leadership patterns. The processes of communication: interviewing, counseling, appraisal of performance, and the accomplishment of change. Special employment groups and overview of the individual in his organization. *(Not open to students who have taken 45.511, 45.512.)* (Offered Fall and Winter Quarters) (Available at Boston and Burlington)

45.691 Creative Problem Solving (2 q.h.)
New ways of thinking are learned and practiced. Sensing and analyzing problems, producing ideas, evaluating and implementing solutions. The attitudes and climate conducive to creative thinking as well as common barriers will be presented. Provides methods for developing imagination which is the key part of the creative process. (Offered Fall and Spring Quarters) (Available at Boston only)

49.536, 49.537, 49.538 Group Dynamics I, II, III (6 q.h.)
Students explore the theoretical and practical applications of group dynamics to their current and future work situations. Outside readings, observation of groups, and journal-keeping techniques are employed to assist in class participation. Emphasis is placed upon the student as a group member, the understanding of group processes, and the individual as a change agent. (Available at Boston only)

Quality Control and Management Sciences

Consultant: Prof. R. A. Parsons (College of Business Administration) 437-3255

45.536 Principles of Material Inspection (2 q.h.)
An operating and technical-level course involving mensuration, need and function of inspection and specifications; basic principles and techniques of measurement; various methods and equipment used for gauging and measuring; special measuring and inspection problems. (Offered Fall Quarter) (Available at Burlington only)

45.561 Statistical Quality Control I (2 q.h.)
Description and practical application of the basic statistical quality-control methods for quality assurance, quality control and quality improvement of products and services; the determination of process capability; the use of quality control charts for measurable and non-measurable quality characteristics. *Prereq. 39.513.* (Offered Fall Quarter) (Available at most campuses)

5.562 Statistical Quality Control II (2 q.h.)
Continuation of Statistical Quality Control I, covering the application of statistical and probability considerations in acceptance sampling of purchased material, work in process, and outgoing products. Methods of predicting sampling results using the hypergeometric, the binomial, and the poisson distributions; development of the operating characteristic curve for any sampling plan; risks involved in sampling and the concepts of AQL, RQL, AOQL. *Prereq. 45.561.* (Offered Winter Quarter) (Available at most campuses)

5.563 Management of Quality Control (2 q.h.)
Modern concepts of managing the quality function of a company to maximize customer satisfaction at minimum quality cost; the idea of total quality control; measurement of the cost of quality; development of a coordinated program of improvement, organizing for diagnosis the defect causes. (Offered Spring Quarter) (Available at most campuses)

5.565 Industrial Experimentation I* (2 q.h.)
Modern small sample techniques are applied to industrial problems. Use of statistical inference to make estimates and set confidence intervals of key characteristics of production lots and processes; design of single and multiple factor experiments; tests of significance; analysis of variance. *Prereq. 39.513.* (Offered Winter Quarter) (Available at Burlington only)

5.566 Industrial Experimentation II* (2 q.h.)
Tests of significance, analysis of variance; correlation techniques; experimental design; balancing and randomizing techniques; factorial designs; nested designs; Latin square; random balance/multiple-balance. *Prereq. 45.565.* (Offered Spring Quarter) (Available at Burlington only)

5.608 Quality Control and Management (Intensive) (6 q.h.)
Same as 45.561, 45.562, and 45.563. *(Not open to students who have taken these courses.) Prereq. 39.513.* (Offered Fall Quarter) (Available at Boston only)

5.630 Introduction to Operations Research (2 q.h.)
Decision making under uncertainty integration of classical statistics and decision theory with Bayesian concepts; decision tree analysis; preference curves. (Offered Fall Quarter) (Available at Boston and Burlington)

5.631 Operations Research Applications I (2 q.h.)
Mathematical programming; linear programming; graphical, vector, simplex, and transportation methods; the dual; degeneracy; integer programming; non-linear programming; dynamic programming. (Offered Winter Quarter) (Available at Boston and Burlington)

5.632 Operations Research Applications II (2 q.h.)
Special topics including model building, queuing theory, simulation, Pert-CPM, and game theory. (Offered Spring Quarter) (Available at Boston and Burlington)

5.633 Advanced Quality Control I* (2 q.h.)
Detailed study of specialized techniques used in defect-cause diagnosis and problem analysis. Complete analysis of progress capability; the multi-vari chart; pictograms; the span plan method. *Prereq. 45.562.* (Offered Fall Quarter) (Available at Boston only)

45.634 Advanced Quality Control II* (2 q.h.)
Continuation of Advanced Quality Control I with special emphasis on design o control plans for process quality control and special cases of product accep tance. *Prereq. 45.624.* (Offered Winter Quarter) (Available at Boston only)

45.692 Quality Control I, II (Intensive) (4 q.h.)
Description and practical application of the basic statistical quality-contro methods for quality assurance, quality, control, and quality improvement o products and services the determination of process capability; the use of quality control charts for measurable and non-measurable quality characteristics. The application of statistical and probability considerations in acceptance samplinç of purchased material, work in process, and outgoing products. Methods o predicting sampling results using the hypergeometric, the binomial, and the poisson distributions; development of the operating characteristic curve for any sampling plan; risks involved in sampling and the concepts of AQL, RQL, AOQL *(Not open to students who have taken 45.561, 45.562.) Prereq. 39.513.* (Offered Winter Quarter) (Available at Boston only)

Law

Consultant: Mr. H. Olins, Esq., 482-6998

45.541 Law I* (2 q.h.)
CONTRACTS: nature, kinds, and formation of contracts; essential elements interpretation of contracts. (Available at most campuses)

45.542 Law II* (2 q.h.)
AGENCY: nature, formation, and termination of agency relationships; rights and duties of principal and agent; scope of agent's authority.
SALES: nature of sales contracts; warranties; transfer of title; rights and remedies of seller and buyer. *Prereq. 45.541.* (Available at most campuses)

45.543 Law III* (2 q.h.)
NEGOTIABLE INSTRUMENTS: bills, notes and checks; liabilities and defenses of parties; procedure upon dishonor; discharge.
BUSINESS ORGANIZATIONS: survey of corporations and partnerships. *Prereq. 45.542.* (Available at most campuses)

45.643 Law (Intensive)* (6 q.h.)
CONTRACTS: nature, kinds, and formation of contracts; essential elements; interpretation of contracts.
AGENCY: nature, formation, and termination of agency relationships; rights and duties of principal and agent; scope of agent's authority.
SALES: nature of sales contracts warranties; transfer of title; rights and remedies of seller and buyer.
NEGOTIABLE INSTRUMENTS: bills, notes, and checks; liabilities and defenses of parties; procedure upon dishonor; discharge.
BUSINESS ORGANIZATIONS: survey of corporations and partnerships. *(Not open to students who have taken 45.541, 45.542, 45.543.)* (Offered every quarter) (Available at Boston, Burlington, and Weymouth)

*Upper level Business Administration course—see page 57.

45.693 Law and Social Issues (2 q.h.)
A study of the structure and dynamics of the American Legal System approached through an analysis of selected cases dealing with social issues. (Offered every quarter) (Available at Boston and Burlington)

Management Information Systems

Consultant: Mr. T. J. McNamara 479-4949
Associate Consultant: (EDP) Mr. R. M. Morrison 742-4000

45.570 Electronic Data Processing I (2 q.h.)
An introduction to computers including the discussion of numbers and coding systems; examples of typical business problems; and study of basic programming concepts. (Offered every quarter) (Available at all campuses)

45.571 Electronic Data Processing II (2 q.h.)
A survey of available computer systems; price and performance comparison of available input, output, and storage media; discussion of filing and sorting techniques; and presentation of COBOL and other programming languages. *Prereq. 45.570.* (Offered every quarter) (Available at all campuses)

45.572 Electronic Data Processing III (2 q.h.)
A presentation of data communications concepts and terminals; discussion of business data processing and operations research applications; and a summary of trends in EDP. *Prereq. 45.571.* (Offered every quarter) (Available at all campuses)

45.648 Electronic Data Processing (Intensive) (6 q.h.)
An introduction to computers including the discussion of numbering and coding systems; examples of typical business problems; and study of basic programming concepts. A survey of available computer systems; price and performance comparison of available input, output, and storage media; discussion of filing and sorting techniques; and presentation of data communications concepts and terminals. A presentation of COBOL and other programming languages; discussion of business data processing and operations research applications; and a summary of trends in EDP. *(Not open to students who have taken 45.570, 45.571, 45.572.)* (Offered every quarter) (Available at Boston, Burlington, and Weymouth)

45.675, 45.676 Electronic Data Processing (A), (B) (6 q.h.)
An introduction to computers including the discussion of numbering and coding systems; examples to typical business problems; and study of basic programming concepts. A survey of available computer systems; price and performance comparison of available input, output, and storage media; discussion of filing and sorting techniques; and presentation of data communications concepts and terminals. A presentation of COBOL and other programming languages; discussion of business data processing and operations research applications, and a summary of trends in EDP. (Offered Spring Quarter) (Available at Boston only)

Associate Consultant: (Programming) Mr. J. G. Sullivan 443-3122

45.599 Basic Computer Programming (2 q.h.)
A one-quarter survey course in introductory computer programming for business students. Fundamentals of programming are introduced along with COBOL, Common Business Oriented Language. The divisions of COBOL, Data File Structure, verb actions are studied. Each student will prepare and check out programs using the University's Computer Center. *Prereq. 45.572.* (Offered every quarter) (Available at all campuses)

45.573 Computer Programming for Business I (2 q.h.)
Fundamentals of business application programming: Introduction to COBOL, Common Business Oriented Language, adopted as standard business programming language of EDP industry. Principles of flowcharting. Programs prepared by student are run and checked out using the University's Computer Center. *Prereq. 45.572.* (Offered Fall and Winter Quarters) (Available at most campuses)

45.574 Computer Programming for Business II (2 q.h.)
Programming in COBOL presented in more detail. Business data-processing functions of editing, file updating, report writing are illustrated and implemented in programs prepared by students and run on University's Computer. Programming involves punched card input and line printer output. *Prereq. 45.573.* (Offered Winter and Spring Quarters) (Available at most campuses)

45.575 Computer Programming for Business III (2 q.h.)
More sophisticated programming techniques as applied to the solution of more complex business application problems. Random access disk file organization and processing is illustrated. Disk and magnetic tape files are utilized in problem solving. *Prereq. 45.574.* (Offered Spring and Summer Quarters) (Available at most campuses)

45.617 Advanced Computer Programming I* (2 q.h.)
Introduction to assembler language programming using the University's Computer Center. Organization, representation, and processing data within the computer. Looping, instruction modification, indexing, indirect addressing and data retrieval are introduced. Cursory survey of assembler languages in general. *Prereq. Demonstrate familiarity with any currently available computer language.* (Available at Boston only)

45.618 Advanced Computer Programming II* (2 q.h.)
Further exploration of assembler language techniques, other addressing structures, floating point techniques, coding and use of macro instructions. Input/output routines, use of operating system for job scheduling, resource allocation, file handling. Business problems analyzed, flowcharted, programmed, and debugged on University's computer by students. Debugging of problems by core dump analysis. *Prereq. 45.617.* (Available at Boston only)

45.619 Advanced Computer Programming III* (2 q.h.)
Utilization of business data processing hardware on University's computing system. Further use of operating system, divide independent file handling. Blocked and unblocked file manipulation. Application of assembler language to a sophisticated programming project. *Prereq. 45.618.* (Available at Boston only)

*Upper level Business Administration course—see page 57.

45.644 Computer Programming for Business (Intensive) (6 q.h.)
Fundamentals of business application programming: Introduction to COBOL, Common Business Oriented Language, adopted as standard business programming language of EDP industry. Principles of flowcharting. Programs prepared by students are run and checked out using the University's Computer Center. Programming in COBOL presented in more detail. Business data processing functions of editing, file updating, report writing are illustrated and implemented in programs prepared by students and run on the University's computer. Programming involving punched card input and line printer output. *Prereq. 45.572. (Not open to students who have taken 45.573, 45.574, 45.575.)* (Offered Winter Quarter) (Available at Boston and Burlington)

45.677 Operating Systems I (2 q.h.)
Survey type course—describing operating systems and investigating the full range of systems services available under computer operating systems. Special emphasis is placed on their value as tools for developing management information. (Note: This quarter could stand alone as management tool for decision making.) *Prereq. 45.575.* (Available at Boston only)

45.678 Operating Systems II (2 q.h.)
Specific Software covered will be systems supervisor, data management system, FORTRAN, COBOL, PL/1, and special purpose compilers. Also investigated will be operating systems which accommodate network analysis, Pert systems, simulation packages. and statistical analysis packages. *Prereq. 45.677.* (Available at Boston only)

45.679 Operating Systems III (2 q.h.)
Detail analysis on data management systems with specific case studies and development of operating system programs. *Prereq. 45.678.* (Available at Boston only)

45.680 Computer-Communications Systems Design and Analysis I (2 q.h.)
An introduction into data communications as seen from the systems and applications viewpoints. Discussions of the various types of terminals: Teletype-like, CRTs, Banking, programmable. Discussions of the various line disciplines with detail examination of one or more. An overview of terminal usage with time sharing, transaction processing, and network processing. *Prereq. 45.575.* (Available at Boston only)

45.681 Computer-Communications Systems Design and Analysis II (2 q.h.)
Discussions and studies of access methods for communications and USER visibility to terminals; introduction to the COBOL communication facility; introduction to and detail discussion of Front End Processors and Remote Network Processors with emphasis on functionality. *Prereq. 45.680.* (Available at Boston only)

45.682 Computer-Communications Systems Design and Analysis III (2 q.h.)
Discussion of the communications aspects of Transaction processing. Case studies are used to illustrate alternative approaches. Presentation and usage of the functional approach to information network design. *Prereq. 45.681.* (Available at Boston only)

45.684 RPG Programming (2 q.h.)
Provides a working knowledge of the Report Program Generation language. This language is suited to small scale computer usage for such tasks as: Report Generation; File Up-dating; utility functions. Students will prepare and debug class problems using the RPG of their choice. (Offered every quarter) (Available at Boston, Burlington, Weymouth, and Norwood)

45.685 Computer Programming for Scientific Applications I* (2 q.h.)
Designed to provide the student with a working knowledge of FORTRAN, the modern problem-oriented computer language. Enables the professional to understand the use of a computer in solving problems in business, mathematics, and the social and physical sciences by introducing him to problems in selected applications, and illustrating use of FORTRAN in finding solutions. *Prereq. 45.572.* (Available at Boston only)

45.686 Computer Programming for Scientific Applications II* (2 q.h.)
The course provides the student with practical experience in the use of FORTRAN in solving significant problems in business, mathematics, and the social and physical sciences. Problems of sufficient complexity will be used to allow the student to actively participate in the various steps necessary to analyze, define, document, and solve the problem using FORTRAN. *Prereq. 45.685.* (Available at Boston only)

45.687 Computer Programming for Scientific Applications III* (2 q.h.)
A sophisticated set of problems are presented to teams of students for solution. Consultations with instructor allows students to actively participate in solving problems with the use of FORTRAN. *Prereq. 45.686.* (Available at Boston only)

49.530 Privacy and Security (2 q.h.)
A clarification of the issues of computer privacy, security, and confidentiality with emphasis on computer security. Review of past violations of privacy, security, and potential threats. Development of security approaches, techniques, and methods of implementing security. *Prereq. 45.572.* (Offered Fall and Winter Quarters) (Available at Boston and Burlington)

49.531 Data Base Systems (2 q.h.)
An introduction to data-base approach to the design of integrated information applications. Data-base design, data structures, diagramming, CODASYL data definition language, data manipulation language, data-base implementation and evaluation. *Prereq. 45.575, 45.588.* (Offered Fall and Winter Quarters) (Available at Boston and Burlington)

49.532 Minicomputer Systems in Business I* (2 q.h.)
An introduction to the application of minicomputers in the business environment. Topics covered include: analysis of cost/performance; systems consideration of minis versus alternatives; role of minis in a variety of applications such as: time sharing, intelligent terminals, data entry and gathering, data communications, and others. Emphasis is placed on evaluation of minis as cost-effective elements of a business system. *Prereq. 45.573, 45.591.* (Available at Boston and Burlington)

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*Upper level Business Administration course—see page 57.

49.533 Minicomputer Systems in Business II* (2 q.h.)
Development of system specifications, functional configurations, system trade-offs, site preparation, and maintenance considerations. Detailed analysis of systems with specific case studies related to business applications. *Prereq. 49.532.*

49.534 Minicomputer Systems in Business III* (2 q.h.)
Minicomputer programming fundamentals; source and object programs; assemblers; compilers; high-level languages; and operating systems. *Prereq. 45.703. Coordinator:* Mr. R. E. Anderson, 862-6831

45.577 Data Systems Administration (2 q.h.)
The major phases involved in the study and detailed planning for the effective use of data processing equipment and management sciences in meeting the information needs of business are presented, including the analysis of company objectives, the feasibility study, the system specifications, equipment selection, and the implementation of the new system. *Prereq. 45.572* (Offered Fall Quarter) (Available at Boston, Burlington, and Weymouth)

45.578 Business Data Processing Applications I (2 q.h.)
Each student is given an opportunity to understand and perceive a company as a total operating system. Specific systems applications examined include inventory control, purchasing, accounts payable, and their integration. Specific techniques on data collection including data communications are dealt with during the quarter. A field trip to a communications training center and a team case study project complete the quarter. *Prereq. 45.577.* (Offered Winter Quarter) (Available at Boston, Burlington, and Weymouth)

45.579 Business Data Processing Applications II (2 q.h.)
A continuation of 45.578 covering additional information systems of accounts receivable, sales analysis, the design of integrated systems, a review of "on-line" systems, and computer system simulation. The opportunity to participate in a computer simulation exercise is offered during a field trip. A team case study project completes the quarter. *Prereq. 45.578.* (Offered Spring Quarter) (Available at Boston, Burlington, and Weymouth)

45.586 System Design and Techniques I (2 q.h.)
Introduction to system concepts, system department organization, forms design, systems controls, and manuals. *Prereq. 45.503 or 45.572.* (Available at Boston, Burlington, Weymouth, Norwood and Revere)

45.587 System Design and Techniques II (2 q.h.)
Development of system techniques through lectures and case studies, including work simplification, work measurement, flowcharting, system cost estimating, and system development. *Prereq. 45.586.*

45.588 System Design and Techniques III (2 q.h.)
Application of system techniques through extensive use of case studies covering the full spectrum of system development and design. *Prereq. 45.587.*

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*Upper level Business Administration course—see page 57.

45.589 Advanced Business System Design I* (2 q.h.)
Introduction to total computer-based system concepts, resource management, functional data flows, information feedback process, and major design criteria. *Prereq. 45.588.* (Available at Boston and Burlington only)

45.590 Advanced Business System Design II* (2 q.h.)
Detailed analysis of a manufacturing company's business system design, focusing on data base design and subsystem relationships between order entry, production control, and inventory control. *Prereq. 45.589.*

45.591 Advanced Business System Design III* (2 q.h.)
Management information system design, including the impact of advanced capabilities such as data communication, on-line file storage, and simulation on the design and system approach. *Prereq. 45.590.*

45.592 Advanced Computer System Techniques I* (2 q.h.)
On-line data communication systems covering the range of services available, remote input and output devices, techniques of control, and application examples. *Prereq. 45.591.* (Available at Boston and Burlington only)

45.593 Advanced Computer System Techniques II* (2 q.h.)
On-line mass storage devices, data-base design, and file retrieval techniques. Real-time input-output techniques including visual and graphic displays. *Prereq. 45.592.*

45.594 Advanced Computer System Techniques III* (2 q.h.)
Timesharing system concepts, design, and languages. Application of on-line and timesharing system techniques through case studies and field trips. *Prereq. 45.593.*

45.616 Government Data Processing Applications I (2 q.h.)
Discusses the basic role of data processing in the current governmental activities in education (including computer assisted instruction), health (including patient care), welfare (including urban planning), information (including graphic storage and retrieval systems) through description of scientific advanced systems and equipment. *Prereq. 45.572.* (To be offered 1976–1977)

45.653 Government Data Processing Applications II (2 q.h.)
Describes principal applications and specific advanced system designs and equipment which have been employed successfully by various levels of government in the fields of public administration, planning, finance, law enforcement and judicature, communication, and integrated information bases. *Prereq. 45.616.*

45.655 Auditing Data Processing Applications I (2 q.h.)
A general presentation of auditing techniques used when auditing typical electronic data processing installations. Functional assignment of duties within an electronic data processing installation. Control over input/output and over data processing. Methodology of safeguarding record files, both physical and against unauthorized use. *Prereq. 45.572.* (No longer offered as single-quarter course)

*Upper level Business Administration course—see page 57.

45.656 Auditing Data Processing Applications II (2 q.h.)
A continuation of auditing applications when reviewed for internal control, hardware checks, system checks, and audit trail. Auditing around the computer versus through the computer. Using the computer to test the data processing system and also the records produced by the computer system. Auditing advanced data processing systems. *Prereq. 45.655.*

45.658 Retail Marketing and Distribution Data Processing Applications I (2 q.h.)
Analyzes the unique characteristics of the retail application including high volume of transactions, low unit value, decentralized input, short-term employees, multi-level reporting and their effects on the EDP systems requirements in each of the classical areas of the organization. *Prereq. 45.572.* (To be offered 1976–1977)

45.659 Retail Marketing and Distribution Data Processing Applications II (2 q.h.)
Develops the systems considerations of the first quarter further into the requirements of an overall, integrated management information system for retail. *Prereq. 45.658.*

45.661 Banking Data Processing Applications I (2 q.h.)
Reviews the major functions of banking, deposit loan, and money, and analyzes their uniqueness from an EDP point of view in the applications of demand deposit accounting, commercial and installment loan accounting, bank credit card accounting, and credit file maintenance. *Prereq. 45.572.* (To be offered 1976–1977)

45.662. Banking Data Processing Applications II (2 q.h.)
Expands on first quarter by analyzing mortgage accounting, savings accounting, mutual fund and stock transfer accounting, personal trust accounting, new remote terminals and the development of management information systems for commercial banks and thrift institutions. *Prereq. 45.661.*

45.664 EDP in Property and Casualty Insurance I (2 q.h.)
A survey of the various functions unique to property and casualty industry and the role of data processing as applied to the particular functions: underwriting, policy production claims, and actuarial. *Prereq. 45.572.* (To be offered 1976–1977)

45.665 EDP in Property and Casualty Insurance II (2 q.h.)
Application of the principles surveyed in the first quarter to one or more case studies developing an information system for property and casualty company management. *Prereq. 45.664.*

45.668 Peripheral Systems Techniques I (2 q.h.)
This course deals with the many peripheral skills and techniques which the modern analyst must employ in his daily activities. Specific areas to be covered include the systems approach to decision making, interviewing, preparing and presenting proposals to executive management, techniques of documentation. *Prereq. 45.573.* (Offered Winter Quarter) (Available at Boston and Burlington only)

45.669 Peripheral Systems Techniques II (2 q.h.)
A continuation of 45.668. This course will cover such topics as the impact of the systems analyst as a trainer; organizational employers of third generation computers; control and systems auditing; and the establishment of data processing standards. *Prereq. 45.668.* (Offered Spring Quarter) (Available at Boston and Burlington only)

45.694 Systems Design and Techniques (Intensive) (6 q.h.)
Introduction to system concepts, system department organization, forms design, systems controls, and manuals. Development of system techniques through lectures and case studies, including work simplification, work measurement, flowcharting, system cost estimating, and system development. Application of system techniques through extensive use of case studies covering the full spectrum of development and design. *(Not open to students who have taken 45.586, 45.587, 45.588.) Prereq. 45.503 or 45.572.* (Offered Spring and Summer Quarters) (Available at Boston and Burlington only)

45.697 Information Processing In Medicine I (2 q.h.)
A non-technical survey of the impact and potential of computers in medicine: medical records; clinical reporting systems; automated laboratories; on-line monitoring; research needs; medical administration requirements. *Prereq. none.* (Offered Fall Quarter) (Available at Boston only)

45.698 Information Processing in Medicine II (2 q.h.)
Analysis of the content and interactions of medical information sub-systems. Implications of computerization of various medical activities; equipment selection; organizational considerations. *Prereq. 45.697.* (Offered Winter Quarter)

49.535 Auditing Data Processing (Intensive) (4 q.h.)
Replaces former courses 45.655 and 45.656. A general presentation of auditing techniques used when auditing typical EDP installations. Functional assignment of duties within an EDP installation. Control over input and output, and processing itself. Methodology of safeguarding record files against physical and/or unauthorized use. *Prereq. 45.572.* (Offered every quarter) (Available at Boston and Burlington only)

47—REAL ESTATE

Consultant: Mr. G. D. Prigmore, 536-2474

47.501 Real Estate Fundamentals I (2 q.h.)
An introduction to the fundamentals of real estate including basic terminology and various types of purchase contracts. Real estate brokerage and leasing fundamentals in commercial, office, and residential properties will also be explored. (Offered every quarter) (Available at most campuses)

47.502 Real Estate Fundamentals II (2 q.h.)
A general examination of real property management with emphasis on the special characteristics of different types of property, along with introduction to valuation of property, including analysis of operating statements. *Prereq. 47.501 or permission of instructor.*

47.503 Real Estate Fundamentals III (2 q.h.)
Real Estate financing will be explored with respect to the various types of institutions involved in the financing of different properties, including interim, permanent, and secondary financing. Specific case studies will also be used. *Prereq. 47.502 or permission of instructor.*

47.504 Real Estate Fundamentals (Intensive) (6 q.h.)
Same as 47.501, 502 and 503. *(Not open to students who have taken those courses.)* (Offered Summer Qurarter)

47.508 Real Estate Financial Analysis I (2 q.h.)
Structure and analysis of real estate income and expense statements. Sources of funds, borrowing methods, effects of taxation, rates of return, etc. *Prereq. 47.503 or permission of instructor.* (Offered Fall Quarter) (Available at Boston and Burlington only)

47.509 Real Estate Financial Analysis II (2 q.h.)
Analysis of risks and problems involved in financing real property with emphasis on use of case studies and problems. Class participation stressed. *Prereq. 47.508 or permission of instructor.* (Offered Winter Quarter)

47.511 Fundamental Real Estate Appraisal (2 q.h.)
A fundamental course in real estate appraisal with emphasis on single- and two- and three-family properties. Analysis of city and neighborhood influences, site valuation, building diagnosis, depreciation; study of the applicable approaches to value, appraisal report preparation. *Prereq. 47.503 or permission of instructor.* (Offered Fall Quarter) (Available at Boston and Burlington only)

47.512, 47.513 Advanced Real Estate Appraisal I and II (4 q.h.)
An advanced course in the evaluation of residential and income properties. Application of the cost, market, and income approaches to apartment buildings and commercial and industrial developments. Particular emphasis on the various methods of capitalization and residual techniques. Class participation in case studies and problems. *Prereq. 47.511, 47.512, or permission of instructor.* (Offered Winter Quarter) (Available at Boston and Burlington only)

47.521 Real Estate Development (2 q.h.)
Analysis of the problems in real estate development using the case method. Emphasis on the risks and opportunities which face developers in the planning, marketing, construction, and financing of apartments, shopping centers, and office buildings. *Prereq. 47.509 or permission of instructor.* (Offered Spring Quarter) (Available at Boston and Burlington only)

47.524 Private Real Estate Law (2 q.h.)
Elements of a real estate contract and its enforceability; the concept of title; mortgages and their purposes; recording of real estate interests; the landlord and tenant relationship. *Prereq. 47.503 or permission of instructor.* (Offered Fall Quarter) (Available at Boston only)

47.525, 47.526 Public Real Estate Law I and II (4 q.h.)
This course will focus on zoning, subdivision control, conservation controls,

taxation of real estate, rent control, eminent domain, and urban renewal. *Prereq. 47.503, 47.525, or permission of instructor.* (Offered Winter and Spring Quarters) (Available at Boston only)

47.527 Housing (2 q.h.)
A specialized course dealing with the demand for housing and the ability of the private market to meet the demand. Particular emphasis placed on public programs dealing with housing via the private sector. *Prereq. 47.509 or permission of instructor.* (To be offered 1976–1977)

47.528, 47.529, 47.530 Real Estate Management I, II, III (6 q.h.)
A course designed to prepare the student for the practical problems of real estate management. The course stresses the requisite day-to-day management of commercial, industrial, and residential properties as well as the need for a management strategy as it relates to long-term property value. *Prereq. 47.503 or instructor's permission* (Available at Boston and Burlington only)

48—TRANSPORTATION & PHYSICAL DISTRIBUTION MANAGEMENT

Consultant: Dr. R. C. Lieb (College of Business Admin.) 437-3236

48.514 Elements of Transportation and Distribution I (2 q.h.)
An introduction to regulatory, economic, and management aspects of transportation from the viewpoints of shippers, government, and carrier managers. Topics include: costs, rates, operations, entry, mergers, intercity passenger and urban transportation. A course of general interest to students of business, law, or government. *Prereq. for all other courses in transportation. (Not open to students who have completed courses 48.501, 48.502, 48.503.)* (Available at Boston, Burlington, Weymouth, and Norwood)

48.515 Elements of Transportation and Distribution II (2 q.h.)
An introduction to physical distribution management concepts. Topics include marketing, locational strategy, organization, inventory control, forecasting, and cost control. Course uses text and case materials developed from industry situations. *Prereq. 48.514. (Not open to students who have completed courses 48.501, 48.502, 48.503.)*

48.516 Elements of Transportation and Distribution III (2 q.h.)
Continued examination of the major elements of the physical distribution mix. Topics include: information flow, data processing, warehousing, and labor relations. Cases include application of the "total cost" approach to physical distribution. *Prereq. 48.515. (Not open to students who have completed courses 48.501, 48.502, 48.503.)*

48.504 Transportation Regulation and Promotion I (2 q.h.)
Study of the history and content of the Interstate Commerce Act. *Prereq. 48.527, 48.514, or former course numbers 48.503 and 48.526.* (Available at Boston only)

48.505 Transportation Regulation and Promotion II (2 q.h.)
Examination of administrative law and procedure, the code of ethics, and the general rules of practice. *Prereq. 48.504.*

48.506 Transportation Regulation and Promotion III (2 q.h.)
Analysis of cases pertinent to the Commerce Clause. Preparation for ICC Practitioners Exam. *Prereq. 48.505.*

48.527 Traffic Management I—Rates and Tariffs (2 q.h.)
A practical course in the interpretation and use of tariffs. Topics include classifications, rate scales, tariff rules, rate-making procedures, etc. *Prereq. 48.514 or former course numbers 48.501, 48.502, 48.503. (Not open to students who have taken former course numbers 48.524, 48.525, 48.526.)* (Available in Boston only)

48.528 Traffic Management II—Rates and Tariffs (2 q.h.)
An advanced course in the interpretation and use of tariffs. Topics include ICC law and practice, and computerized tariffs. *Prereq. 48.527. (Not open to students who have taken former course numbers 48.524, 48.525, 48.526.)*

48.529 Traffic Management III—Selected Topics (2 q.h.)
A practical course in traffic management covering topics other than rates and tariffs. Subjects include: routing, claims, insurance, consolidation, packaging, etc. Course uses cases and text. *Prereq. 48.514 or former course numbers 48.501, 48.502, 48503. (Not open to students who have taken former course numbers 48.524, 48.525, 48.526.)*

48.534 Surface Transportation I—Railroad Management (2 q.h.)
A management-oriented course that considers the current and future status of the railroads. Topics include investment and finance, mergers, marketing, labor relations, operations and control, diversification, and public policy. *Prereq. 48.514 or former course numbers 48.501, 48.502, 48.503. (Replaces former course number 48.511 and 48.512.)* (Offered Fall Quarter) (Available at Boston only)

48.535 Surface Transportation II—Motor Carrier Management (2 q.h.)
A management-oriented course that considers the current and future status of the regulated motor-carrier industry. Topics include: equipment selection and finance, mergers, marketing, labor relations, routes, operations and control, and public policy. *Prereq. 48.514 or former course numbers 48.501, 48.502, 48.503. Replaces former course numbers 48.517, 48.518.)* (Offered Winter Quarter) Available at Boston only)

48.536 Surface Transportation III—Marine Transportation Management (2 q.h.)
A management-oriented course that considers the current and future status of the U.S. Merchant Marine. Topics include: international trade patterns, government promotion and subsidy, technological innovations, port facilities, and labor relations. *Prereq. 48.514 or former course numbers 48.501, 48.502, 48.503. Replaces former course number 48.513.)* (Offered Spring Quarter) (Available at Boston only)

48.537 Surface Transportation IV—Private Trucking Management (2 q.h.)
Initiating a private trucking operation. Topics include legality, purchase vs lease of equipment, operations, and measures of performance. *Prereq. 48.514 or former course numbers 48.501, 48.502, 48.503. (Replaces former course number 48.519.)* (Offered Spring Quarter) (Available at Boston only)

48.538 Management of Warehouse Operations (2 q.h.)
A practical course in the management of warehouses. Topics include: site selection, construction, finance, operations, measurement of performance, and warehouse technology. *Prereq. 48.514, 48.515, 48.516. (Replaces former course number 48.521.)* (Offered Fall Quarter) (Available at Burlington only)

48.539 Organization and Control of Physical Distribution Management (2 q.h.)
Establishment of a physical distribution organization. Measuring performance. Interrelationships with other functions in the company. Interpersonal relations. *Prereq. 48.514, 48.515, 48.516. (Replaces former course number 48.522.)* (Offered Winter Quarter) (Available at Burlington only)

48.540 Management Science and Physical Distribution Management (2 q.h.)
Application of quantitative techniques to physical-distribution management including: linear programming, simulation, and statistical decision theory. Students will use computer facilities for solving problems. (*Knowledge of programming is not required.) Prereq. 48.514, 48.515, 48.516, or 10.539 (math), or equiv. (Replaces former course number 48.523.) (Not offered 1975–1976)*

48.541 Air Transportation Management I (2 q.h.)
Economics and regulation of Civil Aeronautics Board certified commercial passenger aviation—including routes, schedules, operations, pricing, mergers, cost analysis, and financing. Case method of instruction emphasized. *Prereq. 48.514.* (Available at Boston only)

48.542 Air Transportation Management II (2 q.h.)
Similar topics as 48.541, but for cargo operations. *Prereq. 48.541.*

48.543 Air Transportation Management III (2 q.h.)
Economics and regulation of general aviation including analysis of corporate, air taxi, and third-level operations. *Prereq. 48.542.*

48.547 Urban Transportation I (2 q.h.)
The planning and financing of urban transportation systems. Role of federal, state, and local governments. Choice of technology and method of financing. The concept of "balanced" transportation. *Prereq. 48.514. (Replaces former course number 48.544.)* (Offered Fall Quarter) (Available at Boston only)

48.548 Urban Transportation II (2 q.h.)
Management of urban transportation systems. Topics include: routes and services, pricing, labor relations, selection of equipment, community relations, and measures of performance. *Prereq. 48.547. (Replaces former course numbers 48.545, 48.546.)*

48.549 Seminar in Selected Transportation and Physical Distribution Management Topics (2 q.h.)
A seminar which focuses on a topic of particular interest during the academic year, for example, reappraisal and formulation of National Transportation Policy, labor relations in transportation, ecology and transportation, etc. The seminar will utilize speakers and published materials and will require a written or oral presentation by the students at the end of the course. The seminar topic will

be announced during the academic year in time for registration for the Spring Quarter. *Prereq. 48.514.* (Offered Spring Quarter) (Available at Burlington only)

48.600 Seminar in Northeast Corridor Transportation (2 q.h.)
Analysis of the demand for and supply of passenger and freight transportation in the Northeast Corridor. Topics include: government policy, technology, carrier strategy, the consumer, and interrelationships between transportation and economic activity. Students make a presentation of their research findings at the end of the course. This course should be of interest to students of business, government, engineering, economics, and planning. *Prereq. 48.514 and 10.539 (math), or equiv.* (Offered Spring Quarter) (Available at Boston only).

50—EDUCATION FOUNDATIONS

50.111 Social Science I (3 cl., 3 q.h.)
Cultural anthropology and education. Theories and concepts in cultural anthropology will be studied with primary emphasis on their relevance to informal and formal aspects of educational processes. Considerable attention will be devoted to the study of cross-cultural materials in order to understand the educational process in different cultural milieus.

50.112 Social Sciences II (3 cl., 3 q.h.)
Sociology and education. Involves sociological analysis of the educational enterprise in the United States and other technologically advanced societies, including consideration of the socialization process, the formation of youth cultures, and the function of the schools in these contexts. Attention will be given to the study of the effects of stratification, ethnic, and racial factors on educational institutions, education and social change, and the school as a social system.

50.113 Social Science III (3 cl., 3 q.h.)
Intergroup relations and education. Examination of theoretical and empirical materials relative to the problem of intergroup relations and prejudice. Particular attention will be paid to the role of education in the reduction of intergroup conflict.

50.121 Human Development and Learning I (4 cl., 4 q.h.)
Developmental processes from prenatal life up to adolescence, theories of learning and personality, with research and case material covering major aspects of psychological development.

50.131 Human Development and Learning II (4 cl., 4 q.h.)
Continuation of Human Development and Learning I. Significant aspects of adolescence—physical, social, and psychological factors as they influence adolescent behavior. *Prereq. 50.121.*

50.141 Measurement and Evaluation (4 cl., 4 q.h.)
The fundamentals of measurement; basic statistical concepts and techniques used; evaluation of standardized and teacher-made tests. *Prereq. Methods and Materials course in major field.*

50.151 Backgrounds of American Education (4 cl., 4 q.h.)
Historical and philosophical foundations of American education beginning with old-world origins; development of American schools and educational thought from the Colonial period to the present with emphasis on major current issues in education. *Prereq. 50.141.*

51—EDUCATION — INSTRUCTION

51.135 Analysis of Teaching and Educational Process (4 cl., 4 q.h.)
The relationships that exist between instructional objectives and teaching behavior; applications of human development and learning concepts as they relate to subsequent specialized teaching methods and materials. Research results and promising theory are used to extend the prospective teacher's concepts of the teaching function. *Prereq. 50.131.*

51.143 Methods and Materials of Teaching English (4 cl., 4 q.h.)
An introduction to the structure and functions of language as they apply to the teaching of English; curriculum and planning in English; the unit approach; specific techniques of teaching reading and literature, grammar and usage, written and oral composition, listening, spelling, vocabulary, and the use of mass media. *Prereq. 51.135.*

51.151 Student Teaching with Related Seminar (8 q.h.)
A University-arranged practicum of observation and teaching in schools within reasonable commuting distance of Northeastern. Participating on a full-time basis, the student is expected to develop planning and communication abilities within his major field. Biweekly seminars at the University provide additional opportunity to analyze theory-practice relationships and to examine generic problems of teaching. *Prereq. Permission of adviser.*

54—EDUCATION — READING

54.126 Teaching Reading in Secondary Schools (4 cl., 4 q.h.)
For English and social studies majors in the College of Education who are preparing for teaching in the junior or senior high schools. Basically the same approach and organization applies to this course as to the elementary level course.

63—THERAPEUTIC RECREATION SERVICES

63.501 Introduction to Therapeutic Recreation Services (2 q.h.)
Philosophy and scope of modern recreation and its role in society.

63.505 The Nursing Home Experience (2 q.h.)
Exchange of empirical data relating to case experiences and institutional procedures encountered by activity leaders and other practitioners in nursing homes. Feasibility of functional innovations will be discussed in relation to present practices.

63.510 Philosophy of Recreation and Leisure (2 q.h.)
Goals for American recreation studied in modern context; implications for the professional; historical background, concepts of work, leisure, recreation; trends, issues, and future direction.

63.521 Recreational Skills I (Social Recreation) (2 q.h.)
Techniques of leadership, planning, and motivation for social-recreation activities; mixers, table games, active and inactive group games, adapting and creating games.

63.522 Recreation Skills II (Music Therapy) (2 q.h.)
Theory and practical application of music activities in special therapeutic settings.

63.523 Recreation Skills III (Guitar or Autoharp) (2 q.h.)
An introductory course in tablature reading; designed to develop personal skills for accompaniment of group singing.

63.524 Recreation Skills IV (Intermediate Guitar) (2 q.h.)
Development of performance versatility and art of improvisation for students who either have completed Recreation Skills III or who possess basic competence with the instrument.

63.531 Techniques of Recreation Leadership (2 q.h.)
Study and practical experience in a diversity of group programs and processes.

63.532 Interagency Planning for Community Action (2 q.h.)
A study of agencies and how they function (program and personnel); how agencies cooperate for interagency programming. Legal and financial aspects and their effect on the program.

63.535 Recreation Skills VI (Special Events and Programs) (2 q.h.)
How to organize and administrate tournaments for selected activities; checkers, chess, card games, table games, party planning, and techniques.

63.540 Analysis of Movement as Applied to Recreation I (2 q.h.)
The identification of muscles and muscle groups that may be involved in therapeutic recreation activities, which will enable the student to select the most suitable activity for a given disability. Includes analysis of movement and a review of muscle attachment and action.

63.541 Analysis of Movement as Applied to Recreation II (2 q.h.)
Continuation of 63.540. *Prereq. 63.540 or equiv.*

63.547 Outdoor Education for Handicapped (2 q.h.)
Technical training and experiences for adapted recreation and education for exceptional and handicapped age groups.

63.549 The Process of Aging (2 q.h.)
The experience and viewpoints from leading professional people—from the fields of medicine, psychiatry, sociology, nursing, rehabilitation, research, counseling, education, and recreation—related to the process of aging.

63.550 Group Dynamics I (2 q.h.)
The group process; how groups arrive at group identity; factors influencing size, purpose, behavior patterns, selections of individual members; training and experience in leadership techniques.

63.551 Group Dynamics II (2 q.h.)
A continuation of Group Dynamics I. *Prereq. 63.550.*

63.552 Leadership and Program for Ill, Aged, and Infirm (2 q.h.)
The scope of program planning and leadership in a variety of activities including adapted square dances, drama and puppetry, developing a rhythm band, parties and special events, active and quiet games, and others.

63.553 Techniques and Resources in Working with Elderly (2 q.h.)
Course on how to deal with day-to-day problems such as the ability to converse or understand different languages; understanding diseases and disabilities of the aged; techniques in assisting the blind or deaf; sensitivity training and sources of assistance in these areas.

63.555 Therapeutic Recreation for Special Groups (2 q.h.)
Concentrated study and individual projects in areas of special interest; mentally retarded, handicapped, aging, culturally deprived, socially atypical, others.

63.556 Workshop in Adapted and Hospital Recreation (2 q.h.)
Investigation in depth of basic and recent developments in adaptive and hospital recreation. Reports, discussions, observations, and visitations.

63.557 Recreation Activities of Atypical Individuals and Groups (2 q.h.)
Adaptation of recreational activities to meet the needs of handicapped individuals in hospitals and other organizations offering recreation programs for handicapped. Emphasis on the basic principles of recreational therapy.

63.559 Group Dynamics (Intensive) (4 q.h.)
The group process: how groups arrive at group identity; factors influencing size, purpose, behavior patterns, selections of individual members; training and experience of leadership techniques. *(Equiv. to Group Dynamics I & II)*

63.560 Development and Utilization of Recreation Education Resources (2 q.h.)
Survey of field and audiovisual education and resources; instruction and practice in the use of equipment and materials.

63.565 Social and Psychological Impacts of Disabilities I (2 q.h.)
An interdisciplinary approach to social and psychological understanding of the impact of disabilities and handicaps, enabling the activity leader to evaluate and understand behavioral changes in a handicapped population.

63.566 Social and Psychological Impacts of Disabilities II (2 q.h.)
Continuation of 63.565. *Prereq. 63.565 or equiv.*

63.567 Social and Psychological Impacts of Disabilities (Intensive) (4 q.h.)
The equivalent of 63.565 and 63.566.

63.570 Arts and Crafts I (2 q.h.)
Opportunities to learn and to teach in various media: clay, paper, crayon, paint, print, leather, wood, metal, yarn, natural and scrap materials; emphasis on creativity.

63.571 Arts and Crafts II (2 q.h.)
Course is geared to teach design skills and craft skills at the same time. Present the basic elements of design to plaster, stone, metal, papier-mache, clay, wood, wire, cloth, and wax, and exploit the qualities of each medium. *Prereq. 63.570 or equiv.*

63.572 Arts and Crafts III (2 q.h.)
Continuation of Arts and Crafts II. *Prereq. 63.571 or equiv.*

63.573 Arts & Crafts (Intensive) (4 q.h.)
Opportunities to learn and teach the various media: clay, paper, crayon, paint, print, leather, wood, metal, yarn, natural and scrap materials; emphasis on creativity. Course is geared to teach design skills and craft skills at the same time. Present the basic elements of design to plaster, stone, metal, papier-mache, clay, wood, wire, cloth, and wax, and exploit the qualities of each medium. *(Equiv. to Arts and Crafts I and II)*

63.592 Independent Study (3 q.h.)
Independent study designed for the individual specific needs. Field assignments in nursing homes for practical experience. Special and specific assignments. *Prereq. 63.501.*

63.593 Independent Study (4 q.h.)
Continuation of 63.592. *Prereq. 63.592.*

63.600 Seminar in Group Dynamics (2 q.h.)
Seminar covering all aspects of motivation, behavior patterns, and the general process procedures. *Prereq. 63.551.*

86 & 87—HEALTH PROFESSIONS

Courses open to all Health Profession Students.

86.502 Hospital Law and Ethics (2 q.h.)
A study of important legal principles and rulings of importance to medical administrative personnel and others. Brief introduction to interpersonal ethics in patient care.

86.504 Foundations of Medical Science I (2 q.h.)
Study, primarily through physicians' lectures, of major disease problems in our society and modes of treatment. Intended for the non-medical student who wishes an understanding of the problems faced by the physician in daily practice, to facilitate communication between medical and non-medical members of the health team. Discusses organized care, diagnosis, and treatment.

86.505 Foundations of Medical Science II (2 q.h.)
A continuation of 86.504, emphasizing reproduction, birth, pediatrics. Dental health and dermatology also discussed.

86.506 Foundations of Medical Science III (2 q.h.)
A continuation of 86.505. Heart disease; cancer; stroke; blood and lymphatic diseases; accidents; musculo-skeletal, respiratory, and gastro-intestinal diseases.

86.507 Medical Terminology I (2 q.h.)
An intensive introduction to medical terminology including stems, prefixes, and suffixes. Practice in usage.

86.508 Medical Terminology II (2 q.h.)
A more extensive and in-depth consideration of medical terminology. Intended for the medical records specialist. *Prereq. 86.507.*

86.509 Medical Terminology (4 q.h.)
Combines the content of 86.507 and 86.508.

86.511 Personal and Community Health (2 q.h.)
Principles of personal health and healthful living and their application to interpersonal relationships and community life. Discusses important contemporary health problems.

86.512 Foundations of Medical Science (3 q.h.)
Combines the content of 86.504 and the first half of 86.505. Offered for day programs only.

86.513 Foundations of Medical Science (3 q.h.)
Combines the content of the second half of 86.505 and 86.506. Offered for day programs only.

86.515 Home Health Care (3 q.h.)
A combination lecture and field training program designed to provide the technical skills required for the provision of effective community home health care. *Prereq. Permission from the Dean.*

86.516 Principles and Practice of Community Mental Health (3 q.h.)
The course will provide a rudimentary understanding of the basic principles and techniques of modern community mental health practice. Supervised clinical experience will be provided.

86.521 Public Health I (2 q.h.)
Principles of public health. Organization of health agencies and services.

86.522 Public Health II (2 q.h.)
Continuation of 86.521, emphasizing community organization for health services. *Prereq. 86.521.*

86.524 Methods and Materials in Public Health Education (2 q.h.)
An introduction to health education in the public health context. *Prereq. 86.511 or 86.522.*

86.531 Man's Present Environment (2 q.h.)
A survey of environmental conditions in land, air, and water. The causes of pollution; effects on man and other life; and a general discussion of current control methods. Particular emphasis on the significance of environmental problems to the individual.

86.532 Environmental Problems and Control (2 q.h.)
Aspects of environmental engineering on a municipal scale are presented in a format directed to the nonprofessional. Discussion of topics in water supply and water quality, waste water treatment and disposal, solid waste management, milk and food sanitation, and noise control, in the language of the interested citizen.

86.533 Pollution and the Global Environment (2 q.h.)
Threats to the environment on a global scale from man's activities, and an examination of various methods and recommendations for control of atmospheric, oceanic, and land pollution.

86.541 Medical Care and Current Social Problems I (2 q.h.)
Seminar course discussing society's organization to deliver medical care services.

86.542 Medical Care and Current Social Problems II (2 q.h.)
A continuation of 86.541 discussing topics identified in the first part of the course as matters of great concern in the field of medical care. *Prereq. 86.541.*

86.543 Medical Care and Current Social Problems III (2 q.h.)
A continuation of 86.542, examining current professional literature of medical care. *Prereq. 86.542.*

86.545, 86.546 Contemporary and Controversial Issues in Family Health I, II (4 q.h.)
A survey of contemporary health topics will be offered. Timely issues will be analyzed to differentiate fact and opinion. The course is designed for nonmedical individuals desiring authentic information on current health matters. General and mental health topics will be covered.

86.548 The Health of the Young Child (2 q.h.)
A course for people working in health programs that reach out to families through clinics, schools, etc. Emphasis on early child development, on relating to the child in his immediate environment, and on expanding observation skills to increase early identification of children with special needs.

86.500 Orientation and Counseling for Family Health Workers (non credit)
Discussion of the role of family health workers in the community; their relationship to health centers and to other members of the medical team. Discussion of professional standards and future career possibilities.

86.571 Long-Term Care Administration I (2 q.h.)
The organization of care for the long-term acute and chronically ill patient. Goals and purposes of nursing homes; types. Budgeting, financing, administration, and services.

86.572 Long-Term Care Administration II (2 q.h.)
Nursing units; role of the physician. Nursing home-hospital relationships. Therapies. Social Work. *Prereq. 86.571.*

86.573 Long-Term Care Administration III (2 q.h.)
Design of long-term care facilities, capital funding, staffing, budgeting, public relations. *Prereq. 86.572.*

86.539 Health, Disease, and Disability I (Formerly 86.574) (2 q.h.)
A study of the major disease or disability states and their impact on human physiology and psychology. Social and individual response to these states. Lectures, demonstrations, field visits. Part I emphasizes medical areas. *Prereq. 86.506 or 86.513, and 18.306, 18.309, or 18.326.*

86.540 Health, Disease, and Disability II (Formerly 86.575) (2 q.h.)
A continuation of 86.574. Part II emphasizes surgical areas. *Prereq. 86.574.*

86.577 Long-Term Care Administration IV (2 q.h.)
The nature and problems of aging—individual and social considerations. *Prereq. 86.573.*

86.578 Long-Term Care Administration V (2 q.h.)
The care of elderly patients in home, community, and institutions. *Prereq. 86.577.*

86.579 Long-Term Care Administration VI
Seminar course on the provision and improvement of services to the elderly. *Prereq. 86.578.*

86.581 Hospital Organization and Management I (2 q.h.)
The history and development of hospitals—the contemporary hospital system. Different types of hospital organizations. For middle-management personnel.

86.582 Hospital Organization and Management II (2 q.h.)
A continuation of 86.581; hospital departments, their organization, functions, and interrelationships. For middle-management personnel. *Prereq. 86.581.*

86.583 Hospital Organization and Management III (2 q.h.)
A continuation of 86.582. New methods of patient care. For middle-management personnel. *Prereq. 86.582.*

86.601 Communications for Health Care Personnel I (2 q.h.)
A two-part course blending the demands of careful interviewing techniques, thorough record keeping, and accurate and articulate health correspondence. Emphasis will be placed on effective interaction between patients and health personnel, and between health workers and staff members of health agencies. This course will also deal with the means of effecting good communicative skills with community resources for the benefit of patients.

86.602 Communications for Health Care Personnel II (2 q.h.)
Continuation of 86.601.

86.603 Seminar: Criteria and Correlation of Therapeutic and Rehabilitative Services (2 q.h.)
Exposure to and interpretation of the proper use of the therapies in home health care. Discussion of those employed in aiding the emotionally and mentally disturbed individual. The role of the health care worker in families where such services are required. *Prereq. Permission of Instructor.*

86.604 Seminar: Relevant Topics in Health Care for Family Health Workers (2 q.h.)
Discussion of the rights of patients and families in relationship to health problems; how to implement community resources in a meaningful manner; and consideration of current topics that become relevant to health care of the family. *Prereq. Enrollment in Program for Family Health Workers.*

The following courses are offered by Business Administration and are available to students in the health science and other health profession programs

45.697 Information Processing in Medicine I
A non-technical survey of the impact and potential of computers in medicine; medical records; clinical reporting systems; automated laboratories; on-line monitoring; research needs; medical administration requirements. *Prereq. none. (Offered Fall Quarter)*

45.698 Information Processing in Medicine II
Analysis of the content and interactions of medical information subsystems. Implications of computerization of various medical activities; equipment selection; organizational considerations. *Prereq. 45.697.*

Courses open to medical record students only

86.544 Medical Records Field Practice and Research Seminar (3 q.h.)
Full-time field assignment in affiliated hospital medical record departments with research assignments and regularly scheduled seminar and conference sessions. *Prereq. 85.558 and permission of instructor.*

85.551 Organization of the Medical Record Department I (2 q.h.)
The study of the hospital, patterns of organization, lines of responsibility and authority, medical staff and administrative organization, departmental functions and organization. The planning aspects of management are stressed. *Prereq. 86.556.*

86.552 Organization of the Medical Record Department II (2 q.h.)
The study of fundamental principles and successful practices in getting office work accomplished. Office management problems and their solution, conceptive framework for the operation of essential management function, facilities, solutions, and contributions to the office.

86.553 Organization of the Medical Record Department III (2 q.h.)
The study of the controlling function in the Medical Record Department. Quality control, time standards, cash controlling, budgeting, and office manuals. Work simplification and systems as it applies to the Medical Record Department.

86.554 Medical Record Science I (4 q.h.)
Introduction to medical records; history of the medical record, and medical record forms. A study of the professional medical record administrator and his relationship to the health facility. Medical staff and committees in the hospital. Quantitative analysis of the medical record. *Prereq. 80 q.h. of credit including 18.524, 18.525, 18.526, 86.507, and 86.508.*

86.555 Medical Record Science II (4 q.h.)
A study of the numbering, filing, securing, and preserving of medical records. Includes the study of principles of law as related to patient care and medical records. Study and practice of medical transcription. The rules of privileged communications and the release of information to agencies stressed. *Prereq. 86.554.*

86.556 Medical Record Science III (4 q.h.)
A study of the basic principles of compiling statistics for hospitals and other health institutions. Includes the preparation of the daily census, discharge analysis, monthly, annual, and special reports. Birth and death certificates. *Prereq. 86.555.*

86.557 Medical Record Science IV (4 q.h.)
Principles of standardized nomenclature of diseases and operations. International classification of diseases, adapted—8. Study of other indexes used in Medical Record Department, directed laboratory practice for proficiency. *Prereq. 86.556 and 86.506.*

86.558 Medical Record Science V (4 q.h.)
A study of the new and advanced aspects of medical record science. Includes such topics as skilled nursing facilities, neighborhood health centers, utilization review, PSRO, and cancer registry. *Prereq. 86.557.*

86.559 Current Issues in Medical Record Administration (2 q.h.)
Seminar course discussing new problems presented by changing patterns of medical care. Review of the current literature.

86.564 Seminar in Medical Record Science (3 q.h.)
Class discussion of experiences in the clinical setting. Assigned outside projects. Supervised practice. *(Open only to full-time medical record majors during senior year)*

86.585 Medical Record Computer Science (2 q.h.)
Electronic data processing applications in the medical record environment. The study of the hospital information system. Application of computers in hospital methodology and assessing the need for EDP in medical record environment. Trends in the state of the art and future prospects for medical record management. *Prereq. EDP I and II.*

86.586 Applied Medical Record Science I (3 q.h.)
Clinical practice in medical record science and management techniques at one or more of the affiliated hospitals.

86.587 Applied Medical Record Science II (3 q.h.)
Clinical practice in medical record science and management techniques at one or more of the affiliated hospitals.

86.588 Applied Medical Record Science III (2 q.h.)
Clinical practice in medical record science and management techniques at one or more of the affiliated hospitals.

Courses open to Respiratory Therapy students only

86.591 Introduction to Respiratory Therapy I (4 q.h.)
The development and understanding of the respiratory therapist's role as a member of the health care profession. A concise survey of the normal structures and functions of the human body with particular emphasis on the organs of respiration and circulation and the principle of oxygen transport and tissue metabolism. An introduction to the physical principles governing gas exchange and the design of mechanical equipment. *Prereq. Permission of Director of Program.*

86.592 Introduction to Respiratory Therapy II (4 q.h.)
A continuation of 86.591 with emphasis on ventilation, acid-base balance, blood gases, cardiovascular physiology, and clinical cardiopulmonary pathology.

86.593 Introduction to Respiratory Therapy III (4 q.h.)
An expansion of 86.591 and 86.592 with emphasis on therapy modalities in current use. Topics covered include gas administration systems, humidity and nebulization, mechanical ventilation, and pulmonary function equipment. Special attention is given to the physical and microbial care necessary in applying these modalities.

86.681 Pulmonary Technology I (2 q.h.)
Introduction to basic concepts of pulmonary physiology. The lung volumes, vital capacity and its subdivisions, residual volume, functional residual capacity, and total lung capacity. Pulmonary ventilation and its regulation. Causes, effects, and tests for uneven distribution of inspired gas. A concise survey of important pulmonary functions and laboratory procedures in clinical spirometry. *Prereq. 86.186 or equiv.; 86.115 or equiv.; or permission of instructor.*

86.682 Pulmonary Technology II (2 q.h.)
Pulmonary circulation. Diffusion and factors affecting diffusing capacity. Methods of determining blood O_2, CO_2, and pH. Oxygen-hemoglobin dissociation curves. Significance of anoxemia, anoxia, and changes in arterial PCO_2, CO_2, pH, and acid-base balance. *Prereq. 86.681 or permission of instructor.*

86.683 Pulmonary Technology III (2 q.h.)
Mechanics of breathing, compliance of lungs and thorax, airway resistance, the work of breathing, expiratory flow limitation, flow volume curves, dynamic inhomogeneities, closing volumes and measurements. Evaluation of pulmonary function, obstructive and restrictive patterns. Case studies, special laboratory procedures.

Courses open to Special Respiratory Therapy Program students only

86.691 Applied Clinical Study I (2 q.h.)
A presentation of the techniques, skills, and rationale for the effective administration of gas, humidity, and aerosol therapy. Also introduces the student to quality patient care concepts necessary to develop the ability to function as a member of the health care team. *Prereq. 86.591.*

86.692 Applied Clinical Study II (2 q.h.)
A presentation of the techniques, skills, and rationale for the proper and effective administration of intermittent positive pressure breathing and chest physiotherapy with practical clinical application of both. An introduction to the basic concepts of microbiology and problems of immunization with stress on the clinical problems of infection and the techniques of cleaning and sterilization in the clinical setting. *Prereq. 86.691.*

86.693 Applied Clinical Study III (2 q.h.)
An introduction to the skills, techniques, and rationale necessary to perform proper and effective airway management, cardiopulmonary resuscitation and artificial ventilation therapy presented in the laboratory setting with emphasis on the development of manual dexterity prior to clinical application. *Prereq. 86.692.*

86.694 Applied Clinical Study IV (6 q.h.)
Clinical application of the techniques and skills acquired in the preceding three quarters, with emphasis on the development of an individual who will provide safe and effective respiratory care, together with a basic introduction to pharmacology, clinical medicine, and disease entities. *Prereq. 86.693.*

Courses for Dental Hygiene students enrolled in baccalaureate degree program

86.535 Oral Microbiology and Infectious Disease I (2 q.h.)
The qualitative and quantitative composition of the microbiota inhabiting the various ecologic niches of the oral cavity. Methods which have been used to study the oral microbiota will be critically evaluated. Ecologic factors such as adhesion, growth factors, and physico-chemical environment controlling the establishment of colonization of organisms in such sites will be discussed in detail. *Prereq. Chemistry, Microbiology I.*

86.536 Oral Microbiology and Infectious Disease II (2 q.h.)
The pathogenic potential of plaque microorganisms in terms of caries, periodontal disease, and mixed anaerobic infections will be evaluated. Mechanisms of pathogenicity in each disease state will be discussed. Attempts will be made to use the information developed in the course to project methods of control of the diseases caused by oral microorganisms. *Prereq. 86.535.*

86.537 Advanced Periodontology I (2 q.h.)
The structure of the periodontal tissues at both a light and electron microscopic level will be discussed. Particular attention will be paid to the vascular and cellular changes in inflammation. Consideration of the physiologic and chemical basis of the observed differences in pathological and nonpathological processes

will be examined extensively with emphasis on the dynamics of these changes. *Prereq. Anatomy & Physiology, Chemistry, Pathology.*

86.538 Advanced Periodontology II (2 q.h.)
The etiologic factors responsible for the pathologic alterations discussed in Part One will be examined. Attempts will be made to correlate experimental animal findings with the human clinical situation. Methods of diagnosis, treatment planning, and treatment, as well as approaches to the evaluation of therapeutic efficacy will be discussed. Stress will be placed on relating modern concepts of etiology to alterations in approach to therapy. *Prereq. 86.537.*

Courses open to Radiologic Technology students

86.614 Advanced Radiologic Technology I (2 cl., 2 q.h.)
Review of basic principles; new equipment (operation); special procedures; thermography; ultrasound and video; anatomy and physiology. *Prereq. R. T. or special permission.*

86.615 Advanced Radiologic Technology II (2 cl., 2 q.h.)
The study of specialized procedures which utilize advanced and sophisticated equipment in the fields of: neurology; cardio-vascular, pediatrics, tomography, intraoral, operative procedures. *Prereq. 86.614.*

86.616 Advanced Radiologic Technology III (2 cl., 2 q.h.)
Accounting principles; budgeting, preparing schedules; personnel practices. *Prereq. 86.615.*

86.617 Radioactive Isotopes and Therapy I (2 cl., 2 q.h.)
Review of physics, mathematics, anatomy, treatment planning, radiation units of measurement, and introduction to radioisotopes *Prereq. 86.616.*

86.618 Radioactive Isotopes and Therapy II (2 cl., 2 q.h.)
Radiobiology, nursing procedures, protection and shielding, and supervoltage equipment. *Prereq. 86.617.*

86.619 Radioactive Isotopes and Therapy III (2 cl., 2 q.h.)
Specific procedures, records and administrative procedures, clinical application, and radiobiology. *Prereq. 86.618.*

86.620 Radiologic Technology Orientation I (2 cl., 2 q.h.)
A study of the history of X-rays; medical terminology; nursing and dental procedures pertinent to radiologic technology. *Prereq. none.*

86.621 Radiologic Technology Orientation II (2 cl., 2 q.h.)
A study of pediatrics and proper methods of immobilizing infants. Necessity for standardizing radiographic exposures to protect the patient. Medical and surgical diseases and the effects they cause on anatomy and physiology and the radiograph. *Prereq. 86.620.*

86.622 Radiological Science I (4 cl., 4 q.h.)
A survey of the basic concepts of physics; units of measurement; Newton's

law of motion work; energy; atomic theory of matter; electric currents; magnetism; generators; motors; production and control of high voltage. *Prereq. none.*

86.623 Radiological Science II (4 cl., 4 q.h.)
Interaction of X-rays and matter; nature and production of X-rays, radioactivity; properties of lightwaves; optics; heat transfer and wave motion; dosimetry; X-ray circuits and tubes. *Prereq. 86.622.*

86.624 Principles of Radiology I (4 cl., 4 q.h.)
Chemistry used to process radiographic films; uses of each chemical. A study of the planes of the body; basic positioning of the skeletal system and more detailed positions utilized to demonstrate anatomical parts to best advantage. *Prereq. none.*

86.625 Principles of Radiology II (4 cl., 4 q.h.)
Organization factors of hospitals; financial consideration; legal considerations; proper care and maintenance of X-ray equipment; test equipment necessary; special procedures used in radiology and indications for doing them. *Prereq. 86.624.*

86.626 Radiologic Photography and Exposure I (4 cl., 4 q.h.)
A study of contrast materials used to visualize areas and organs of the body; basic principles of image formation; electromagnetic spectrum; circuits used in radiology; X-Ray tube construction; factors controlling radiographic quality. *Prereq. none.*

86.627 Radiologic Photography and Exposure II (4 cl., 4 q.h.)
Accessory items used to improve radiographic quality; methods of protection for patients and personnel. Effects of radiation on cells and tissue, malignant and benign; therapy planning and treatment; uses of radioactive nuclides for diagnosis and treatment. *Prereq. 86.626.*

86.647 Radiology Practicum (formerly 86.628 & 86.629) (12 q.h.)
Application of theoretical principles presented at the University by performing radiographic procedures under supervision. Assigned homework to be part of lesson plans received while at the hospital, and lectures presented at the hospital and the University. *A.M.A. requirement minimum 2 hrs/week.*

Courses open to students in Medical Laboratory Science programs

87.211 Coagulation (1 cl., 2 lab., 2 q.h.)
Advanced studies in coagulation factory identification and problem solving of coagulation tests. Discussion of related Hematologic Disorders.

87.213 Immunohematology (1 cl., 2 lab., 2 q.h.)
Advanced studies in antigen-antibody detection and problem solving of immunohematological tests. Discussion of related hematologic disorders, and the medical legal aspects of blood banking.

87.222 Histochemistry (of hemic cells) (1 cl., 2 lab., 2 q.h.)
The histochemistry and electronmicrography of hemic cells and the use of these techniques in diagnosis of hematological disorders.

87.540 Seminar in Medical Technology (formerly 18.529) (2 cl., 2 q.h.)
Current topics in medical technology. Required readings and presentations by students. Guest lecturers. *Prereq. Permission*

87.541 Hematology (formerly 18,341) (1 cl., 3 lab., 2 q.h.)
Basic hematological techniques including discussion of the differential smear and observation of the normal morphology of human red cells, white cells, and platelets. *Prereq. 18.512 or equiv.* (Laboratory fee) (Not for Medical Technology or Hematology majors.)

87.542 Morphologic Hematology I (formerly 18.342) (1 cl., 3 lab., 2 q.h.)
Morphologic and etiologic classification of the anemias. Related diagnostic tests will be discussed. *Prereq. 18.541 or equiv.* (Laboratory fee)

87.543 Morphologic Hematology II (formerly 18.343) (1 cl., 3 lab., 2 q.h.)
Studies of pathologic and physiologic deviations of the white cell series as observed in leukemias and infections. Some animal hematology will be included. *Prereq. 18.542 or equiv.* (Laboratory fee)

87.544 Epidemiology I (2 q.h.)
Basic concepts in epidemiology. Causes of disease. Factors contributed by agent, the human host, and the environment. Illustrated by case studies. *Prereq. Microbiology or permission of instructor.*

87.545 Epidemiology II (2 q.h.)
Acquisition and evaluation of data in epidemiology. Relationships of person, time, and place. Case studies and problems. *Prereq. 87.544 or permission of instructor.*

87.546 Medical Laboratory Science Education Seminar (2 q.h.)
A series of seminars designed to prepare the practicing technologist for effective clinical instruction.

87.547 Medical Laboratory Science Administration Seminar (2 q.h.)
A presentation of the principles of personnel and laboratory management, medical and legal aspects of medical technology, and quality control.

87.508 Introduction to Cytotechnology (2 cl., 2 q.h.)
A review of cell structure, principles of microscopy, and staining techniques. Anatomy and physiology of the female reproduction system and study of the non-malignant cytology of the female genital tract. *Prereq. 18.132 or equiv.* (Laboratory fee)

*87.518 **Applied Cytology I** (At Hospital) (4 q.h.)
The microscopic evaluation and screening of benign cytological smears and smears from cervical dysplasia, carcinoma-in-situ, invasive squamous cell carcinoma and adenocarcinoma, and invasive malignant tumors of the female genital tract.

*Available only to students enrolled in the 12-month professional cytology program.

87.528 Cytopathology I (2 cl., 2 q.h.)
Cytopathology and clinical aspects of cervical dysplasia, carcinoma-in-situ, and invasive squamous cell carcinoma. Consideration of endometrial and endocervical carcinoma, other genital tract cancers and radiation effect. *Prereq. 87.508.* (Laboratory fee)

87.538 Cytopathology II (2 cl., 2 q.h.)
Benign and malignant cytology of the respiratory and gastrointestinal systems correlated with the anatomy and physiology. Considerations of clinical aspects. Special collection techniques. Emphasis on cancer of the lung and stomach. *Prereq. 87.528.* (Laboratory fee)

***87.548 Applied Cytology II** (At Hospital) (4 q.h.)
The microscopic evaluation and screening of cytological smears from the respiratory tract, gastrointestinal tract, urinary tract, and from body fluids. Continuing evaluation of Cytological smears from the gynecological tract.

87.558 Cytopathology III (2 cl., 2 q.h.)
Study of benign, atypical and malignant cells exfoliated from various portions of the urinary tract, in serious effusions, cerebrospinal fluid, and breast secretions. *Prereq. 87.528.* (Laboratory fee)

87.568 Cytogenetics and New Concepts (2 cl., 2 q.h.)
Clinical and cytological aspects of genetics, including genetic counseling. Special uses of cytology. Cell research techniques, cancer. Epidemiology and current concepts related to cytotechnology. *Prereq. 87.558 or permission of instructor.* (Laboratory fee)

***87.578 Applied Cytology III** (At Hospital) (4 q.h.)
The microscopic evaluation and screening of cytological smears from all parts of the body. Practical experience in genetic cytology.

87.588 Cytopathology Seminar
Advanced course for students in baccalaureate degree program. Discussion of pertinent journal reports, new methodologies, and research. *Prereq. Permission of instructor.*

87.598 Special Topics (2 cl., 2 q.h.)
Special projects in cytology, cytopathology, or cytotechnology investigated or reviewed and reported by student. Written and oral presentation required. *Prereq. 87.558 or permission of instructor.*

87.608 Seminar: Cytopathology — Criteria and Correlations (4 cl., 2 q.h.)
Presentation, discussion, and interpretation of benign, suspicious, and hormonal conditions. The cytological diagnostic criteria of malignant tumors from various body sites and their histopathological correlation.

***87.618 Applied Cytology IV** (At Hospital) (2 q.h.)
The microscopic evaluation and screening of cytological smears from various body sites. Effects of radiation and of chemotherapy; diagnosis of suspicious and hormonal conditions; cytological observations in pregnancy; and the clinical significance of these.

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*Available only to students enrolled in the 12-month professional cytology program.

94—LAW ENFORCEMENT

94.505 Human Rights in Corrections (2 q.h.)
Consideration of the special practices and problems in the protection of human rights in the institutional environment; legal and practical aspects.

94.506 Basic Statistics in Law Enforcement (2 q.h.)
Introduction to basic statistical information procedures and operations relating to law enforcement areas; interpretation of criminal statistics; crime rates; unrecognized crime; non-reporting; recidivists' rates; individual statistics; evaluation of records; research and data on specialized services.

94.507 Correctional Counseling (2 q.h.)
Basic concepts and principles of counseling; individual and group therapy carried on in the correctional field and institutional services; case study and projects.

94.508 Criminal Investigation and Case Preparation I (2 q.h.)
General investigation techniques; collection and preservation of evidence and information; consideration of particular crimes, including arson, sexual offenses, larceny, burglary, robbery, forgery, and homicide.

94.509 Criminal Investigation and Case Preparation II (2 q.h.)
Conduct of raids; surveillance and undercover operations; methods of preparing a case for court; specialized scientific methods; exercises involving techniques of prosecution and cross-examination. *Prereq. 94.508.*

94.512 Comparative Police Systems (2 q.h.)
A study of existing police systems in other jurisdictions; examination of the organization, administration and practices in police agencies in the United States, Europe, and the United Kingdom.

94.513 Introduction to Industrial Security (2 q.h.)
The historical, philosophical, and legal basis of security; a survey of administrative, personnel, and physical aspects of the security field.

94.514 Interviews and Interrogations I (formerly Police Interrogation I) (2 q.h.)
Interviewing of victims, witnesses, informants, and complainants; demonstration, study, discussion, and practice of techniques and procedures.

94.515 Interviews and Interrogations II (formerly Police Interrogation II) (2 q.h.)
Techniques for legally acceptable questioning of suspects and persons in custody; laws governing interrogation practices; demonstrations, class exercises and assigned projects. *Prereq. 94.514.*

94.516 Security Administration (2 q.h.)
Administration, organization and operations of security and protection units; personnel selection; relationships of business and industry with governmental units.

94.517 Advanced Correctional Practices I (2 q.h.)
Diagnosis and treatment of the drug addict and the alcoholic offender at both

juvenile and adult levels; a study of these and related kinds of personal self-abuse as to causation and treatment. *Prereq. 94.553.*

94.518 Advanced Correctional Practices II (2 q.h.)
Case studies of persons confined; their past and present environment and relationships; consideration of purposeful resolves or regressions. *Prereq. 94.517.*

94.519 Advanced Correctional Practices III (2 q.h.)
Evaluation of correction-psychiatric facilities for the disordered offender, including the aggressive, the assaultive, and the violent subject. *Prereq. 94.518.*

94.520 Traffic Safety and Control I (formerly Traffic Law Enforcement I) (2 q.h.)
A study of the state of the art of highway safety; research; traffic accident investigation; prevention; rescue; automated system of vehicular traffic accident and moving violation data collection; analysis and utilization; speed control; speed zoning techniques; radar; vascar; laws, rules, and regulations.

94.521 Traffic Safety and Control II (formerly Traffic Law Enforcement II) (2 q.h.)
An in-depth study of traffic law enforcement, techniques of selective enforcement; traffic surveys; engineering, safety education, and evaluation of current traffic programs. *Prereq. 94.520.*

94.523 The Law and Institutional Treatment (2 q.h.)
The process of law from arrest of offender through release in its relation to correctional principles and practices; functions of police, defense, prosecution, and courts; legal documents related to commitment.

94.524 Comparative Correctional Systems (2 q.h.)
A study of correctional systems and methods in selected jurisdictions; examination of the organization, administration, and practices in United States and foreign countries.

94.525 Law Enforcement Identification and Records I (2 q.h.)
Records and systems and utilization; survey of forms, files, procedures, standards and uniformity; concentration of theoretical and practical applications.

94.526 Law Enforcement Identification and Records II (2 q.h.)
Theories and practices in personal identification principles; survey and evaluation of present and new identification techniques; historical and legal consideration of identification and record data. *Prereq. 94.525.*

94.530 Police Public Relations (2 q.h.)
The principles of sound public relations for the entire police operation; writing, public speaking, conferences, and all news media; consideration of police image and public opinion.

94.531 Police Community Relations (2 q.h.)
A survey of the role and function of police in intergroup relations; human relations and minority groups; responsibilities of police with civil rights, civil disorders, and public protection.

94.532 Research Methods in Criminal Justice (2 q.h.)
A research project related to some specific police or correctional interest or operation, in consultation with the faculty adviser. Course meets at discretion of the instructor. Project paper required for grade.

94.536 The Patrol Function I (formerly Police Patrol I) (2 q.h.)
The planning process related to the administration of the patrol function. Consideration of theoretical and operational aspects of various patrol systems; random patrol, response force, split force, team policing, probability theory, and the relationship between patrol and crime levels.

94.537 The Patrol Function II (formerly Police Patrol II) (2 q.h.)
A continuation of 94.536 with emphasis upon the goals and objectives of police patrol management models. Discussion and analysis of manpower, work load, response time, patrol communications, preventive strategies, and inputs and outputs of patrol systems evaluated in quantitative form. *Prereq. 94.536.*

94.541 Introduction to Criminalistics I (2 q.h.)
A survey of the elements of microscopy, spectroscopy, and chemistry as applied to trace evidence in criminal investigations; responsibilities of technician, investigator, and others.

94.542 Introduction to Criminalistics II (2 q.h.)
Toxicology and serology; procedures related to other physical evidence; laboratory demonstrations and practical exercises. *Prereq. 94.541.*

94.544 The American Correctional System (2 q.h.)
A critical survey of the correctional field covering probation, institutions, and parole as to historical development, program content, and current problems and needs.

94.546 Social Deviance I (2 q.h.)
A consideration of the social problems of social disorganization, mental disorders, drug addiction, alcoholism, suicide, and sexual behavior.

94.547 Social Deviance II (2 q.h.)
Continuing consideration of world's population crisis, race and ethnic relations, family disorganization, work and automation, poverty and disrepute, war and disarmament. *Prereq. 94.546.*

94.549 Treatment of Offenders I (2 q.h.)
The concept of treatment and corrections; history; classification; training, education and guidance; treatment methods; inmate society; health and social services.

94.550 Treatment of Offenders II (2 q.h.)
Therapy, psychiatric and psychological considerations, case studies, evaluation of comparable methods. *Prereq. 94.549.*

94.551 Correctional Administration I (2 q.h.)
Correctional processes and services, standards, personnel and principles of management; allocation of resources, training of staff.

94.552 Correctional Administration II (2 q.h.)
Study of regular and special programs, volunteers, outside contacts, sentence reduction, discharge planning, work release administration.

94.553 Correctional Administration III (2 q.h.)
Types of institutions; compacts; regional concepts; planning, organizing, controlling, and directing corrections; budgeting. *Prereq. 94.552.*

94.557 Investigative Report Writing (2 q.h.)
Report content and writing, exercises in accurate terminology and concise reporting, interpretation and evaluation of information, practical report-writing projects.

94.560 Police Supervision (2 q.h.)
The police supervisor's role in discipline; interdepartmental relations; problem handling and personnel policies; problems in supervisory relationships; wages, grievances, morale, and safety.

94.561 Police Work with Juveniles (formerly Police Juvenile Methods) (2 q.h.)
The role of the police in delinquency prevention with emphasis on theory, administration, control, treatment, confinement, community resources, and relationships with the public and the juvenile court.

94.563 Criminology I (2 q.h.)
An introduction to the study of crime from the perspective of classical and contemporary criminological theories. In particular, attention is given to biological, psychological and sociological approaches to the explanation of crime.

94.564 Criminology II (2 q.h.)
A continuation of Criminology I with emphasis on the causes of crime and the relationship between law and crime. Specific implications of prevention, rehabilitation and treatment are considered in depth. *Prereq. 94.563.*

94.565 Delinquency Prevention (2 q.h.)
A survey of delinquent behavior, causation, and delinquency prevention programs; seminar projects for discussion of specific problems and general principles in establishing delinquency prevention services.

94.567 Probation and Parole Practices I (2 q.h.)
The probation officer; presentence investigation; conditions of probation; effectiveness, administrative aspects and prediction methods; relationship to community.

94.568 Probation and Parole Practices II (2 q.h.)
The parole officer; conditions of parole; supervision; effectiveness; administrative relationships; relationships to community, court and law enforcement agencies; relationships of probationer and parolee to rehabilitative, social, and family services; consideration of recidivism and aftercare.

94.571 Law Enforcement Management and Planning I (2 q.h.)
Philosophy and theories of management in law enforcement; studies of organization from the administrator's viewpoint, including control, efficiency, effectiveness, and discipline.

94.572 Law Enforcement Management and Planning II (2 q.h.)
A survey of the administrator's role, including special activities and responsibilities; administrative planning civilian personnel, including recruitment, selection, evaluation; training; budgets; management records; interpersonal communications; auxiliary services; evaluation of present and future management systems. *Prereq. 94.571.*

94.574 Juvenile Corrections I (2 q.h.)
A study of police, detention, petition, and hearings related to juveniles; juvenile court procedures, philosophy, and terminology; adjudication.

94.575 Juvenile Corrections II (2 q.h.)
Social workers, probation officers, judges, psychologists, and psychiatrists with relation to juveniles; institutions; aftercare; prevention. *Prereq. 94.574.*

94.577 Government Security Programs I (2 q.h.)
Department of Defense security programs; applicable federal statutes and executive orders; visitor control.

94.578 Government Security Programs II (2 q.h.)
Security clearances under appropriate federal directives; handling classified information; automatic time-phased downgrading and declassification.

94.579 Government Security Programs III (2 q.h.)
Relations with subcontractors, vendors, and suppliers; the protection of proprietary information; legal and practical protection of sensitive data. *Prereq. 94.578.*

94.582 Document Control (2 q.h.)
A detailed study of procedures for handling and control of classified and other sensitive information; a survey of control systems from manual to semi-automated systems using data processing equipment.

94.583 Industrial Fire Prevention (2 q.h.)
Principles and practices of fire safety, including organization and management responsibility, property conservation, safeguards for construction, fire control apparatus and functions, engineering and scientific data on fires and related perils.

94.584 Physical Security I (formerly Plant Protection I) (2 q.h.)
The basic foundations for security in industry, banking, transportation, utilities, and other nongoverning operations; physical requirements and standards.

94.585 Physical Security II (formerly Plant Protection II) (2 q.h.)
Implementation of security; study of inanimate aspects, including alarm and surveillance devices; study of animate aspects of protection. *Prereq. 94.584.*

94.586 Retail Security (2 q.h.)
The operation of security departments including functions of mercantile establishments; dishonest employees; shoplifters; management and public relations; receiving, shipping, and warehousing; special laws and procedures.

94.587 Bank Security Measures (formerly Security Measures for Financial Institutions) (2 q.h.)
An in-depth study of the principles and practices of security measures for banks and other financial institutions and the preparation of rules establishing minimum standards under current federal and state legislation.

94.591 Seminar in Security (formerly Seminar in Industrial Security) (2 q.h.)
An analysis of current problems in security such as growth patterns, salary structures, training and education, existing weaknesses; field trips, individual study assignments, and required oral and written reports.

94.593 Seminar in Correctional Practices (formerly Seminar in Correctional Program Management) (2 q.h.)
An analysis of current problems in corrections designed to meet the needs and interests of specific groups of students, practitioners, supervisors, and administrators of correctional programs.

94.595 The National Law Enforcement Seminar (3 q.h.)
An annual, concentrated exploration of current viewpoints, varied solutions, innovative procedures, and critical analyses in the issues facing law enforcement, correctional practices, and security, drawing on exceptionally qualified local and national figures. A research paper under the direction of a faculty adviser is required for credit.

94.596 Hospital Security (2 q.h.)
The function of protection in the health industry; medical security administration including study of health care providers; trends in hospital law; security from injury, fire and loss in the medical world; security methodology for safeguarding specialty areas; the security role in mass casualty management and emergency preparedness; the concept of professionalism; community liaison; and patient attitudes toward security.

94.597 Current Security Problems (2 q.h.)
An analysis of special problem areas such as security education and training, community relations, white-collar crime, drug abuse, theft control, shoplifting, document control, subversion and sabotage, protection of classified information, control of proprietary information and business espionage, labor problems, civil disturbances, and natural and man-made disasters.

94.601 Law Enforcement Math I (formerly Seminar in Law Enforcement 94.590) (2 q.h.)
A review of elementary algebra: algebraic expressions and operations, equations, word problems. Solutions to mathematical problems in connection with their practical applications in law enforcement.

94.602 Law Enforcement Math II (2 q.h.)
Further review: fundamental operations, measurement and computation, solutions of linear and quadratic equations. Probability, trigonometry, statistics, ratio, and proportion. *Prereq. 94.601.*

94.603 Law Enforcement Math III (2 q.h.)
Methods and applications of algebra: analytic geometry, equations of motion and energy, permutations, combinations. Stress is on problem solving more than theory. Application of these principles are applied to most areas of law enforcement. *Prereq. 94.602.*

94.604 Seminar in Law Enforcement (Youth Crime Control) (2 q.h.)
The criminality and deviance of those between the juvenile and adult age. Consideration is given to: concepts and characteristics of the youthful offender; the role of the family in youth crime; the generation gap; violence of youth hooliganism; drug addiction of youth; ordinary crimes of youth; the youth sub-

culture and culture conflict; the role of mass media and education in youth crime; the concepts of freedom and justice in the youth culture; treatment of youthful offenders; and the state of youth crime control in foreign countries.

94.605 Seminar in Law Enforcement (Victimology) (2 q.h.)
Criminal-victim relationships, with emphasis on victim-precipitated crimes and compensation to the victims. Consideration is given to: concept and significance of "victimology;" time, space, sex, age, and occupational factors in criminal-victim relationships; victims of murder, rape, other violent crimes, and property crimes; victim-typology; the public as victim; restitution to victims of crime; compensation to victims of crime; and the functional responsibility of the victim.

94.606 Seminar in Law Enforcement (International Crime Control) (2 q.h.)
Crimes touching upon more than one country, with emphasis on international criminal law principles, treason, and espionage. Concentration is given to: the concept of law in its comparative aspects; customs; treaties; international conventions; "comity;" culture conflicts; the "international personality;" the "attempt clause;" the Belgian approach; the Oxford approach; asylum, extradition; international ordinary criminals; political criminals; piracy (on sea and in the air); war criminals; genocide; international courts; League of Nations; United Nations; international criminal statistics; Interpol, the Soviet-type spy-schools; the history of American Intelligence.

94.607 Seminar in Law Enforcement (Grantsmanship) (formerly Seminar in Law Enforcement, 94.590) (2 q.h.)
This seminar is designed to familiarize the participants with the orderly sequence of organizational steps required in providing the institutional framework necessary for preparation and submission of applications to granting agencies. Major topics include: Omnibus Crime Control and Safe Streets Act of 1968; functions of the Law Enforcement Assistance Administration; grant application strategy, planning, and research.

94.608 Seminar in Law Enforcement (Law Enforcement Operational Intelligence) (formerly Seminar in Law Enforcement, 94.590) (2 q.h.)
Designed to provide a theoretical understanding of the value and function of an intelligence unit, including planning, directing, organizing, financing, and other salient features of the administration of these units. Emphasis is placed on organized crime, subversive activities, and liaison programs as they apply to a modern police agency.

94.609 Independent Studies (2 q.h.)
Faculty guided research in individually selected topics relating to the criminal justice system.

94.610 Seminar in Law Enforcement (Collective Bargaining) (formerly Seminar in Law Enforcement, 94.590) (2 q.h.)
The history and background of collective bargaining in the public sector as it affects members of the law enforcement field; initial establishment of rights of labor, labor legislation—federal and state; preparation for negotiation, resolutions of impasses, final agreement and operation of the contract.

94.611 Man, Law, and Society I (2 q.h.)
Designed to help the student to improve his capacity to handle problems in the many institutions and sociological processes of the American legal system, and to see these problems in the perspective of their everyday working interrelationships, in order to heighten his awareness of those aspects of familiar and often unnoticed legal problems which call for a perceptive understanding of the functions of the various institutions involved.

94.612 Man, Law, and Society II (2 q.h.)
A general analysis of the way in which major changes occur in the established practices of legal and social organizations and communities. Particularly concerned with the part played by legal institutions in initiating, controlling, and directing or assisting such changes.

64.613 Man, Law, and Society III (2 q.h.)
An introduction to the social science concepts and methods in their current and potential application to social and legal problems. Aims to acquaint the student with a variety of social research concepts and methods of special utility in investigating diverse types of social law related problems.

94.614 Seminar in Law Enforcement (Interviewing Practicum) (formerly Seminar in Law Enforcement, 94.590) (2 q.h.)
Advanced interrogation methods and procedures; techniques of persuasion; conditioning (negative and positive); the polygraph, its history and methodology; the established rules and procedures required for current diagnosis of truth and deception; the evaluation of the contemporary methods of international law enforcement agencies. *Prereq. 94.515.*

94.615 Seminar in Law Enforcement (Organized Crime) (formerly Seminar in Law Enforcement, 94.590) (2 q.h.)
The nature and problems of organized crime; causes and effects; comparative and historic roots; the activities, organization, and economics; possible solutions—the scope and techniques in combating organized crime.

94.616 Seminar in Law Enforcement (Minorities and the Urban Crisis) (formerly Seminar in Law Enforcement, 94.590) (2 q.h.)
An investigation of the ethnic and racial origins and characteristics of the American people; the interaction, conflicts, and possibilities of adjustment between the dominant society and minority groups—particularly in contemporary urban settings, and the role and function of police in their interrelationship with minority groups.

94.617 Seminar in Law Enforcement (Criminal Behavior) (formerly Seminar in Law Enforcement, 94.590) (2 q.h.)
An examination of crime and criminal behavior as a social phenomenon. Three principal divisions: sociology of law and its effect; criminal etiology and the scientific analysis of the causes of crime; evaluation of the various rationales of detention as a crime control factor.

94.618 Seminar in Law Enforcement (Prosecutive Development) (formerly Seminar in Law Enforcement, 94.590) *(Prereq. 94.622, 94.630, 94.632, or 94.634)* (2 q.h.)
Lecture and discussion relating the professional requirements of the modern police officer in the United States; oral testimony; the entire corpus delicti and all other related matters in proper form and sequence; the trial; testimony and the jury; conduct on the witness stand; opposition counsel; the defense of entrapment; opinion testimony; confessions; prospective witnesses; legal standards and the police. *Prereq. 94.622, 94.630, 94.632 or 94.634.*

94.619 Seminar in Law Enforcement (Forensic Laboratory) (formerly Seminar in Law Enforcement, 94.590) (2 q.h.)
Crime laboratory organization and the utilization of special equipment for the analysis interpretation, classification, and identification of physical evidence obtained in crime scene searches. The transportation, storage, and security of physical evidence and the effect of the results, coupled with the preparation of exhibits for courtroom presentation. *Prereq. 94.542.* (Laboratory fee)

94.620 Seminar in Law Enforcement (Intervention Strategies and Tactics for Law Enforcement — Counseling Techniques) (formerly Seminar in Law Enforcement, 94.590) (2 q.h.)
Basic concepts and principles of intervention as a social work method. Nature of therapeutic relationships, principles of communication. Diagnostic assessment of the person-problem-situation configuration. Goal-setting process. Ego supportive procedures and use of community resources.

94.621 Civil Liberties and the Police I (formerly Seminar in Law Enforcement, 94.590) (2 q.h.)
An in-depth preparation for the officer facing the practical problems of enforcing the law without breaching the civil rights of the accused and bystanders; individual readings, lectures, group discussions, and preparations from Massachusetts and national interest cases; many incidents pertinent to the actions of the people involved with these problems will be investigated and studied; constitutional interpretation and limitations are the guidelines for the course.

94.622 Civil Liberties and the Police II (2 q.h.)
Several Supreme Court cases are followed from the time of the call, to the confrontation, arrest, examination in court, appeals, and the direct statements on the problem by jurists of the highest courts. The last section of the term ties in the latest criminal law and civil rights act changes including—but not limited to—criminal justice and no-knock laws and the latest Civil Rights Act provisions. *Prereq. 94.621.*

94.623 Seminar in Law Enforcement (Drugs) (formerly Seminar in Law Enforcement, 94.590) (2 q.h.)
Designed to meet the needs of law enforcement personnel in the problematic area of drug abuse; the law, society classification, distribution, identification, and the effects of drugs.

94.624 Seminar in Law Enforcement (Executive Development) (formerly Seminar in Law Enforcement, 94.590) (2 q.h.)
The role of the police administrator within the managerial structure. Special

problems unique to the law enforcement executive, decision making, policy formation, planning, controlling, communicating, and directing. A consideration of case studies and surveys will be utilized.

94.625 Seminar in Law Enforcement (Mental Health and the Police) (formerly Seminar in Law Enforcement, 94.590) (2 q.h.)
A study of the roles of law enforcement and mental health services. Diagnosis of the triggering mechanisms of behavioral disorders and the suicidal phenomenon; psychiatric and psychological considerations; case studies and the legal process.

94.626 Seminar in Law Enforcement (Data Processing) (formerly Seminar in Law Enforcement, 94.590)
An introduction to automated systems utilized in the field of law enforcement; basic program concepts; filing and sorting techniques; available input and output storage media; types and sources of data communications and applications.

94.627 Administration of Justice I (formerly 94.501) (2 q.h.)
A survey of the evaluation of justice from the earliest times, developed historically, with particular emphasis on Western justice and American justice, including the roles played by the judiciary, with stress on due process and the constitutional guarantees.

94.628 Administration of Justice II (2 q.h.)
An analysis of the various groups and professions in the American justice system. Emphasis is fixed on human relations, efficiency, current trends, and the future role of the American criminal justice system. *Prereq. 94.627.*

94.629 Civil Law in Criminal Justice I (formerly 94.511) (2 q.h.)
Civil matters such as defamation, negligence, assault and battery, false confinement, trespass, conversion, and agency relationships.

94.630 Civil Law in Criminal Justice II (2 q.h.)
Civil matters such as the law of contracts, bailments, domestic relations and business relationships which should be known to and distinguished by law enforcement personnel. *Prereq. 94.629.*

94.631 Criminal Law I (2 q.h.)
Exploration of the major problems of criminal law as a device for controlling socially undesirable behavior. It is intended to give one a working knowledge of the basic questions of public policy involved in the administration of criminal justice and the legal principles of determining criminal liability. Course includes a consideration of specific crimes, elements of a crime, parties to a crime, and defenses to a crime.

94.632 Criminal Law II (2 q.h.)
Consideration of vital constitutional and statutory concepts, including self-incrimination, search and seizure, law of arrest, criminal procedure and responsibility, confessions, right to counsel, and conduct of trial in the District, Superior, Appellate, and Federal Courts. *Prereq. 94.631.*

94.633 Evidence and Court Procedure I (2 q.h.)
Rules of evidence; principles of exclusion; evaluation and examination of evidence and proof.

94.634 Evidence and Court Procedure II (2 q.h.)
Competency, consideration of witnesses, laws of search and seizure, court procedures, moot court exercises. *Prereq. 94.633.*

94.650 Fire Investigation and Arson I (2 q.h.)
A study of the elementary chemistry of combustion involving sources of ignition, fuels, the nature and behavior of gases and their toxicity. The combustion properties of non-solid fuels as opposed to the combustion properties of solid fuels are considered. Also consideration is given to explosions associated with fires. A discussion of the socio-economic aspects of fire including the pyromaniac and his physiological involvement.

94.651 Fire Investigation and Arson II (2 q.h.)
A more concentrated approach is taken in dealing with the fire bug and his sociological orientation. A discussion of carbon, hydrogen, and oxygen as major elements in all fires and the flameless ignition effect. Methods of fireproofing are also considered and references made to various types of building materials as well as the role of pyrolysis. Fire patterns of structural fires and asphyxiation along with the legal aspects of arson are also considered. *Prereq. 94.650.*

94.652 Law Enforcement Fiscal Management
The various budgeting systems and their application to law enforcement organizations including: the line item budget, programmed budget, performance budget, and the planned programmed budget system; development of sound fiscal policy; appropriation of funds; tax base revenue systems; distribution of public monies; budget request, expenditures, and auditing procedures.

94.653 Massachusetts Criminal Law
A comprehensive study of Massachusetts Criminal Law and its application by law enforcement officers. Areas of study include: Common Law, Criminal Statutes, Annotated Laws, Criminal Case Law, Supreme Court Decisions, and Motor Vehicle Law.

94.658 Alcohol Problems in Law Enforcement
Acquaints students with the current state of knowledge on society, culture, and drinking patterns; the variety of alcohol problems that confront peace officers; discussion of the range of solutions available.

94.697 Honors Program I (4 q.h.)
Prereq. Approval of the Dean.

94.698 Honors Program II (4 q.h.)
Prereq. 94.697.

94.699 Honors Program III (4 q.h.)
Prereq. 94.698.

INTENSIVE COURSES

The following are intensive courses. Please refer to the combination numbers for the individual course description previously listed in this catalog.

97.500 Administration of Justice (Intensive) (4 q.h.)
Combination of 94.627 and 94.628.

97.501 Criminal Law (Intensive) (4 q.h.)
Combination of 94.631 and 94.632.

97.502 Evidence and Court Procedure (Intensive) (4 q.h.)
Combination of 94.633 and 94.634.

97.503 Civil Law in Criminal Justice (Intensive) (4 q.h.)
Combination of 94.629 and 94.630.

97.504 Civil Liberties and the Police (Intensive) (4 q.h.)
Combination of 94.621 and 94.622.

97.505 Interviews and Interrogations (Intensive) (4 q.h.)
Combination of 94.514 and 94.515.

97.506 Traffic Law Enforcement (Intensive) (4 q.h.)
Combination of 94.520 and 94.521.

97.507 Law Enforcement Identification and Records (Intensive) (4 q.h.)
Combination of 94.525 and 94.526.

97.508 Introduction to Criminalistics (Intensive) (4 q.h.)
Combination of 94.541 and 94.542.

97.509 Social Deviance (Intensive) (4 q.h.)
Combination of 94.546 and 94.547.

97.510 Law Enforcement Management Planning (Intensive) (4 q.h.)
Combination of 94.571 and 94.572.

97.511 The Patrol Function (Intensive) (4 q.h.)
Combination of 94.536 and 94.537.

97.512 Criminal Investigation and Case Preparation (Intensive) (4 q.h.)
Combination of 94.508 and 94.509.

97.513 Criminology (Intensive) (4 q.h.)
Combination of 94.563 and 94.564.

97.514 Treatment of Offenders (Intensive) (4 q.h.)
Combination of 94.549 and 94.550.

97.515 Probation and Parole Practices (Intensive) (4 q.h.)
Combination of 94.567 and 94.568.

97.516 Fire Investigation and Arson (Intensive) (4 q.h.)
Combination of 94.650 and 94.651.

97.517 Advanced Correctional Practices (Intensive) (6 q.h.)
Combination of 94.517, 94.518, 94.519.

97.518 Correctional Administration (Intensive) (6 q.h.)
Combination of 94.551, 94.552, 94.553.

97.519 Law Enforcement Mathematics (Intensive) (6 q.h.)
Combination of 94.601, 94.602, 94.603.

97.520 Government Security Programs (Intensive) (6 q.h.)
Combination of 94.577, 94.578, 94.579.

97.521 Man, Law, and Society (Intensive) (6 q.h.)
Combination of 94.611, 94.612, 94.613.

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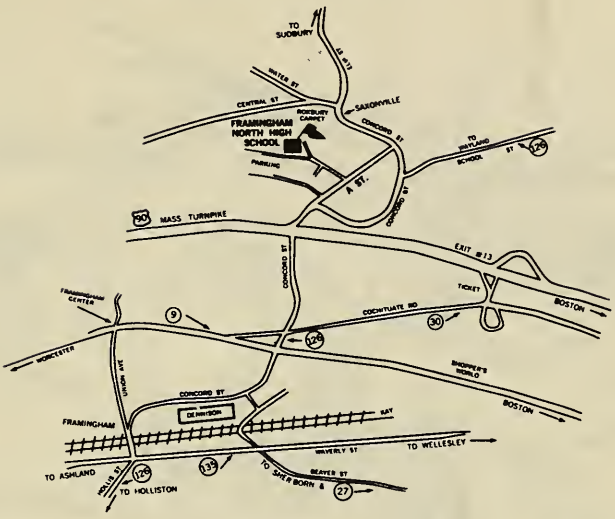
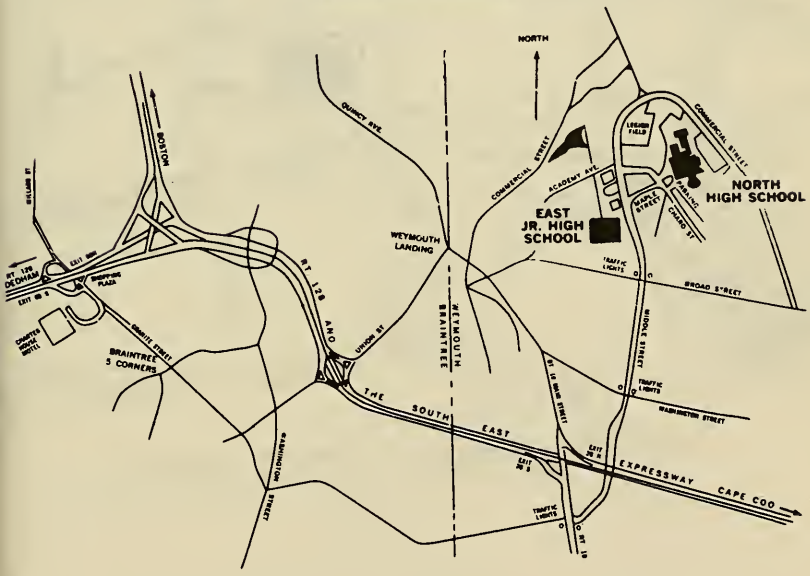
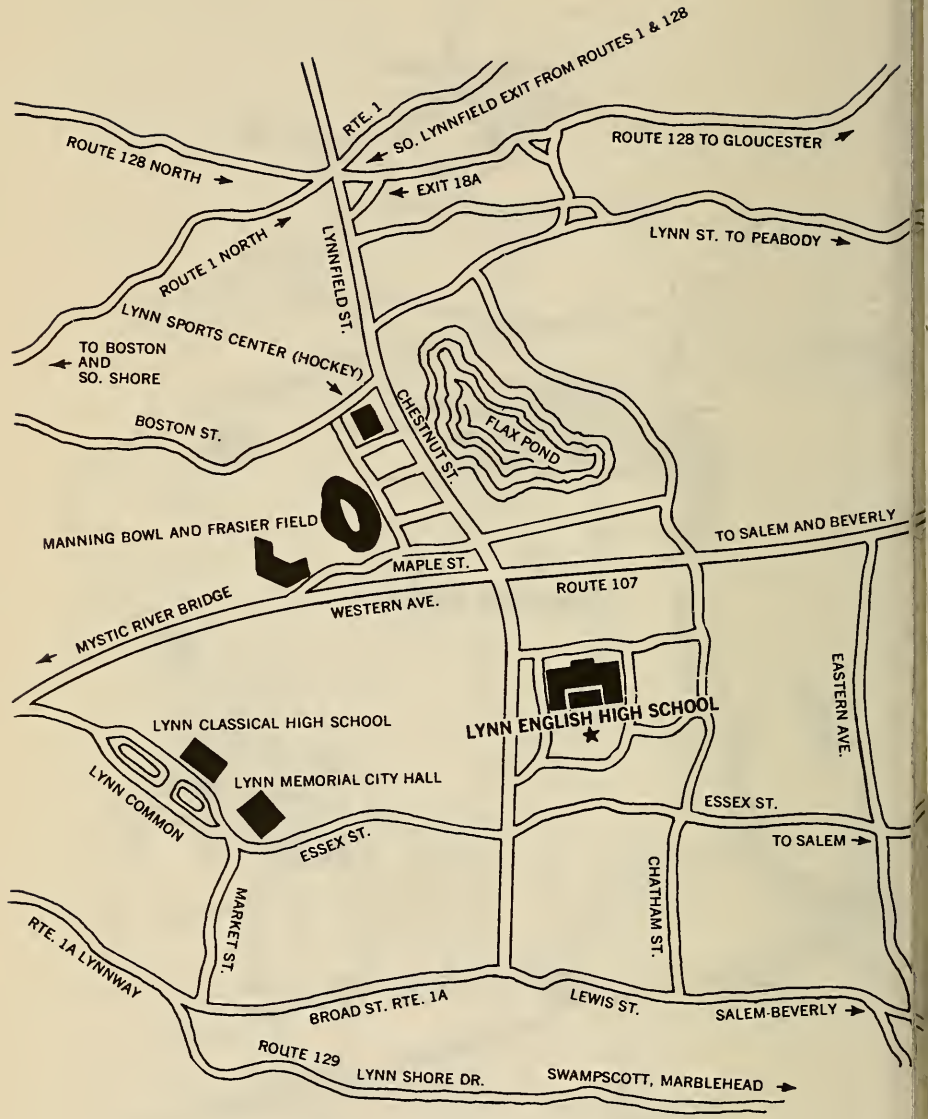


Weymouth Schools

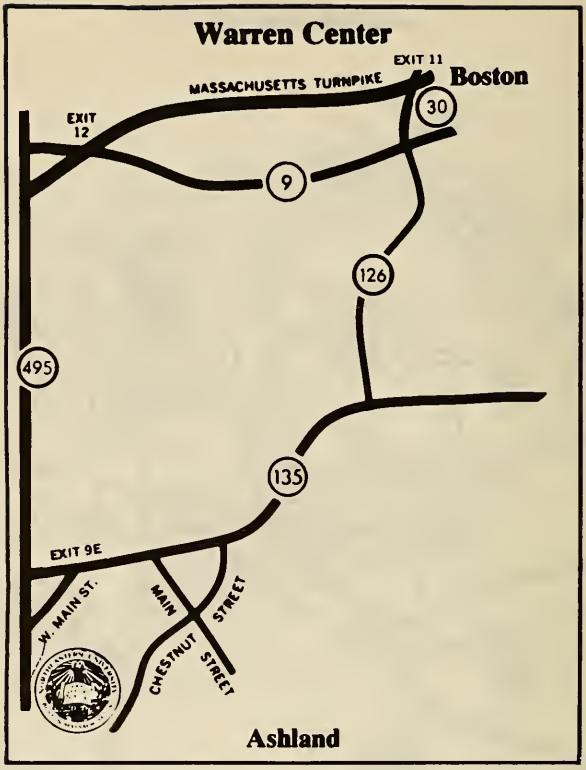


Lynn English High School

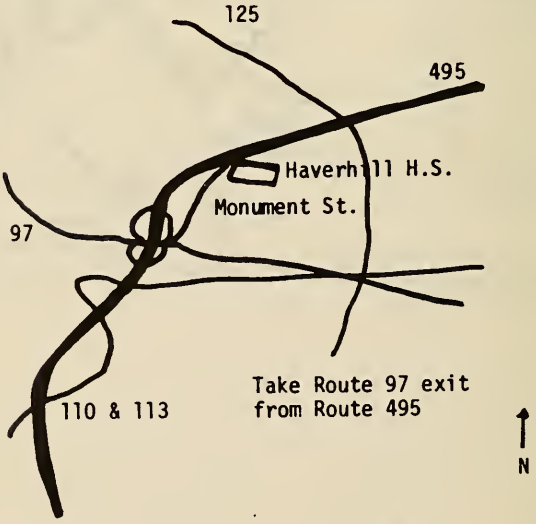


Norwood

WARNICK RD.
WESTOVER PARKWAY
GERMANY BROOK
WESTOVER PARKWAY
NICHOLS ST.
ELLIS POND
MEDFIELD
WINTER ST.
PLAYGROUND
JUNIOR HIGH SCHOOL NORTH
WESTWOOD
PROSPECT ST.
SHATTUCK SCHOOL
NAHATAN ST.
WALPOLE
ROUTE 1A
WALPOLE ST.
ELLIOT ST.
BOND ST.
WINTER ST.
DEDHAM
CHAPEL ST.
WINSLOW AVE.
WASHINGTON ST.
RAILROAD AVE.
PLEASANT ST.
BOSTON
E. WALPOLE
DEAN ST.
NAHATAN ST.
STATE HIGHWAY
U.S. ROUTE 1
PROVIDENCE
NEPONSET ST.
NORWOOD MUNICIPAL AIRPORT
RICHLAND RD.
CANTON
N
W
E



Haverhill High School



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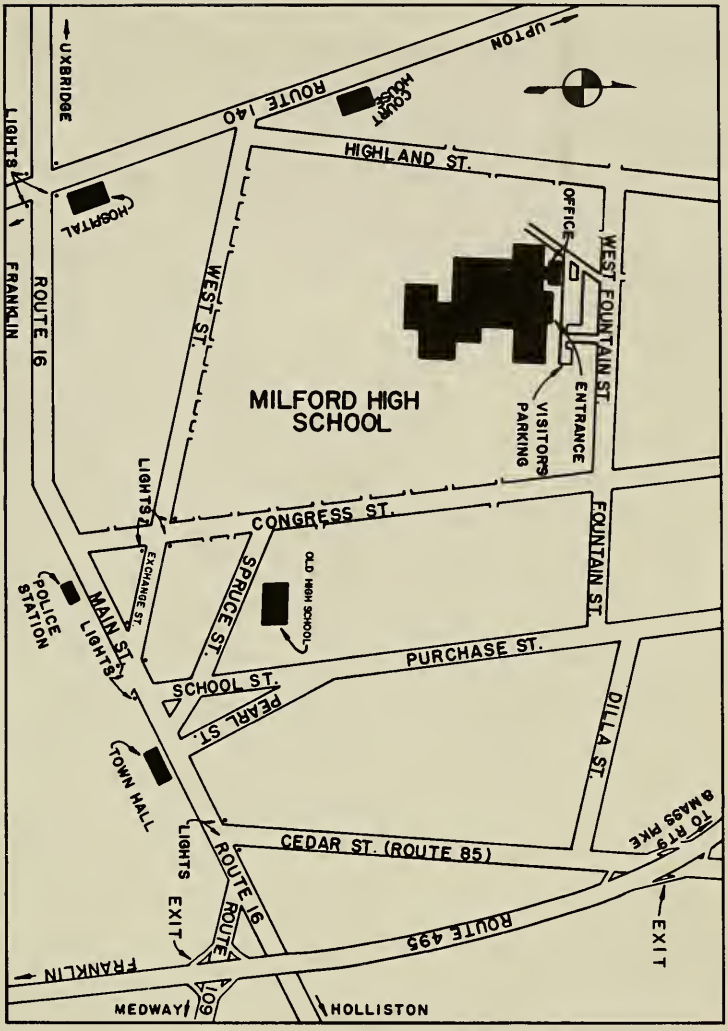
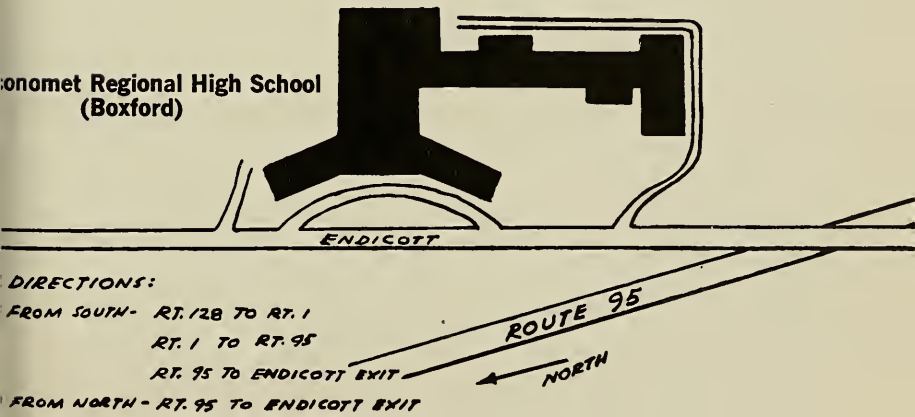


Nonomet Regional High School (Boxford)



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to Mystic Bridge
Northeast Expressway
Rte.95
Washington Ave.
Parkway
Revere Beach
Broadway
Cushman Ave.
School St.
Squire Rd.
Winthrop St.
Beach St.
Revere
H.S.
Northeastern
University
Rte. 1
Harris St.
American Legion Highway
to Boston
Saugus
Parkway
Beach
Revere St.
VFW Parkway
East Boston
N
Revere
North Shore Rd.
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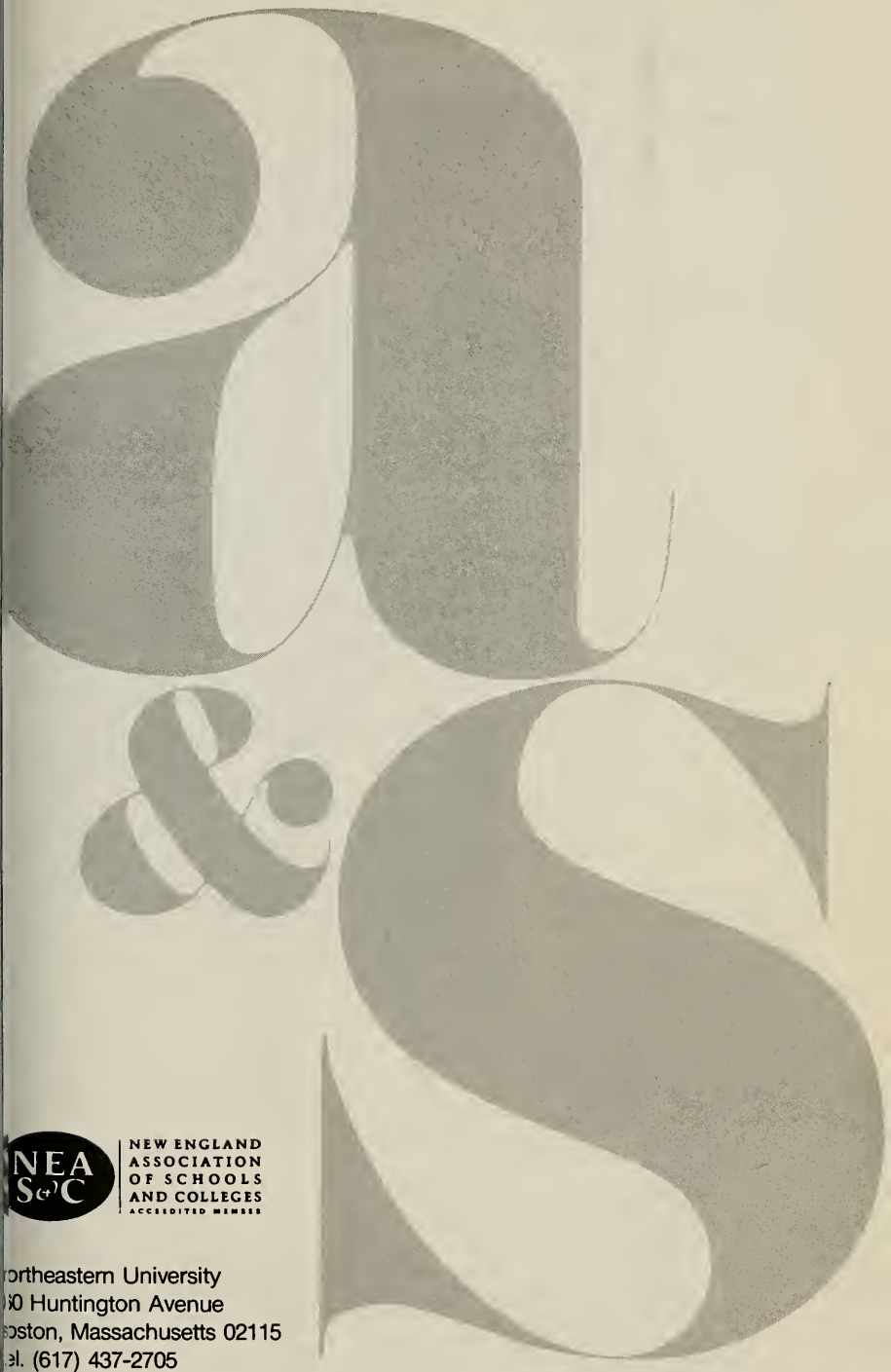

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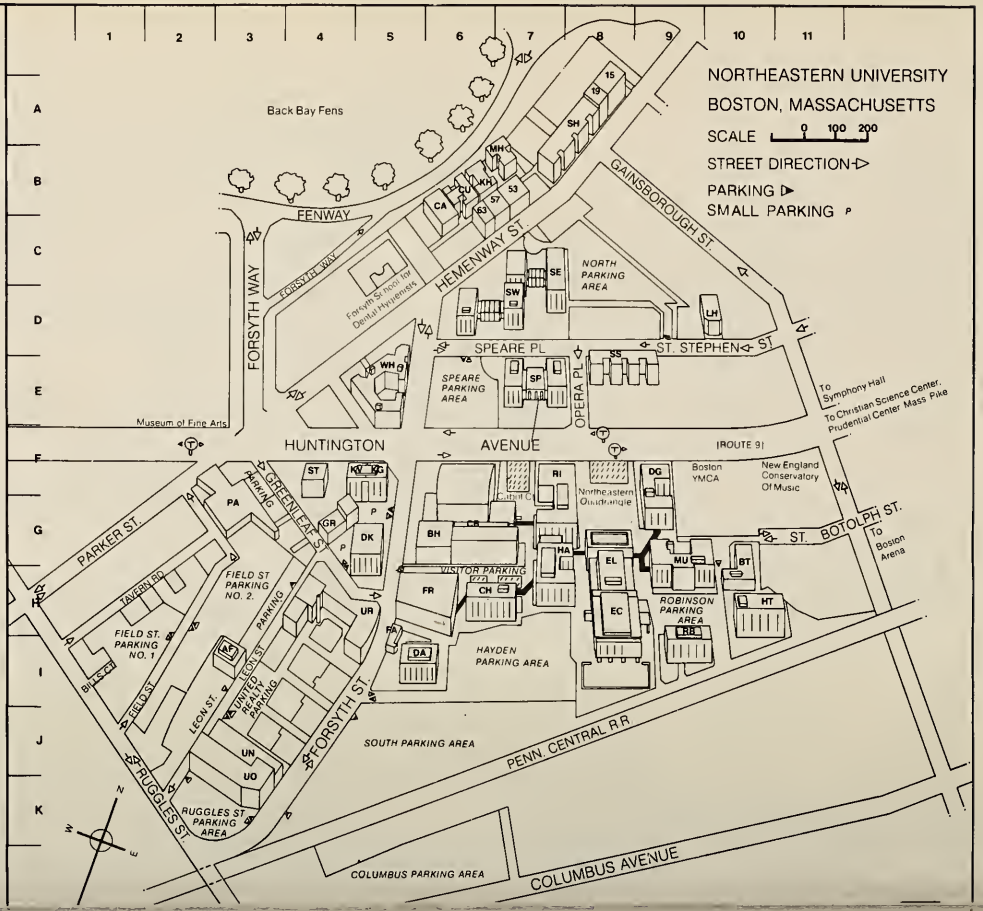
Academic and Service Buildings	Map Code	Bldg. Code
African-American Institute	I3	AF
Barletta Natatorium	G6	BN
Botolph Building	G10	BT
Cabot Physical Education Center	G6	CB
Cahners Hall	C6	CA
Churchill Hall	H6	CH
Cooperative Education Building	F4	ST
Cushing Hall	B6	CU
Dana Research Center	I5	DA
Dockser Hall	G5	DK
Dodge Library	G9	DG
Ell Student Center (Auditorium section)	G8	EL
Ell Student Center (Student Lounge section)	H8	EC
Forsyth Building	H6	FR
Forsyth Building Annex	H5	FA
Greenleaf Building	G4	GR
Hayden Hall	G7	HA
Hurtig Hall	H11	HT
Kerr Hall (Faculty Center)	B6	KH
Knowles Center (Gryzmish Hall section)	F5	KG
Knowles Center (Volpe Hall section)	F5	KV
11 Leon Street	J3	UO
15 Leon Street	J3	UN
Mugar Life Sciences Building	G9	MU
Parker Building	G3	PA
Richards Hall	F7	RI
Robinson Hall	H10	RB
United Realty Building	H5	UR
Dormitories		
115 Hemenway Street	A8	15
119 Hemenway Street	A8	19
153 Hemenway Street	B7	53
157 Hemenway Street	B6	57
163 Hemenway Street	C6	63
Kerr Hall	B6	KH
Light Hall	D10	LH
Melvin Hall	B7	MH
106-122 St. Stephen Street	E8	SS
Smith Hall	B8	SH
Speare Hall	E7	SP
Stetson Hall East	C7	SE
Stetson Hall West	D7	SW



ACADEMIC CALENDAR 1976—1977

Fall Quarter 1976

Registration period		
Burlington	Tuesday—Wednesday	Sept. 14—15
Boston	Monday—Thursday	Sept. 20—23
Classes begin	Monday	Sept. 27
Examination period	Monday—Saturday	Dec. 13—18

Winter Quarter 1976—1977

Registration period		
Burlington	Tuesday	Nov. 30
Boston	Monday—Thursday	Dec. 6—9
Classes begin	Monday	Jan. 3
Examination period	Monday—Saturday	Mar. 21—26

Spring Quarter 1977

Registration period		
Burlington	Tuesday	Mar. 8
Boston	Monday—Thursday	Mar. 14—17
Classes begin	Monday	Apr. 4
Last day to file card for		
Spring Commencement	Friday	Apr. 1
Last day to pay fee for		
Spring Commencement	Friday	Apr. 29
Final grades due in Registrar's		
Office for June graduates	Friday	June 3
Examination period	Monday—Saturday	June 13—18
Spring Commencement	Sunday	June 19

Summer Quarter 1977

Registration period		
Burlington	Monday—Tuesday	June 13—14
Boston	Wednesday—Thursday	June 15—16
Classes begin	Monday	June 27
Last day to file card for		
Fall Commencement	Friday	July 1
Last day to pay fee for		
Fall Commencement	Monday	Aug. 1
Examination period	Wednesday—Thursday	Aug. 3—4

UNIVERSITY HOLIDAYS 1976—1977

Columbus Day	Monday	October 11
Veterans' Day	Thursday	November 11
Thanksgiving Recess	Thursday—Saturday	November 25—27
Christmas Vacation	Monday—Saturday	Dec. 20—Jan. 1
Martin Luther King Day	Saturday	January 15
Washington's Birthday	Monday	February 21
Patriot's Day	Monday	April 18
Memorial Day	Monday	May 30
Independence Day	Monday	July 4
Labor Day	Monday	September 5

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admissions, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or on the basis of being a handicapped but otherwise qualified individual. In addition, Northeastern takes affirmative action in the recruitment of students and employees. Inquiries concerning our equal opportunity policies may be referred to the University Affirmative Action Officer and/or the Title IX coordinator.

Delivery of Services

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the University, which causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements and acts of public authorities. The University will, however, exert reasonable efforts, when in its judgment it is appropriate to do so, to provide comparable or substantially equivalent services, facilities or performance, but its inability or failure to do so shall not subject it to liability.

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1976-1978

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the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of 180 distinguished business and professional men and women.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922); Liberal Arts (1935); Education (1953); Pharmacy (1962); Nursing (1964); Boston-Bouvé College (1964); the College of Criminal Justice (1967); and by Lincoln College's day Bachelor of Engineering Technology Programs (1971). This educational method enables students to gain valuable practical experience as an integral part of their college program and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, actuarial science, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. University College offers evening courses—offered by the University since 1906—and adult-day courses leading to the bachelor's degree. In addition to its day undergraduate programs in Electrical Engineering Technology and Mechanical Engineering Technology, Lincoln College offers evening/part-time certificate, associate, and bachelor degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the Basic College faculties concerned.

GRADUATE AND PROFESSIONAL SCHOOLS

The ten graduate and professional schools of the University offer day and evening programs leading to the degrees listed:

The Graduate School of Actuarial Science offers the degree of Master of Science in Actuarial Science.

The Graduate School of Arts and Sciences offers the degrees of Master of Arts, Master of Science, Master of Science in Health Science, Master of Public Administration, and Doctor of Philosophy.

The Graduate School of Boston-Bouvé College offers the degree of Master of Science, with specialization in Physical Education and Recreation Education.

The Graduate School of Business Administration offers the degree of Master of Business Administration.

The Graduate Program in Criminal Justice offers the degree of Master of Science.

The Graduate School of Education offers the degree of Master of Education and Doctor of Education and the Certificate of Advanced Graduate Study.

The Graduate School of Engineering offers the degrees of Master of Science, Engineer, Doctor of Philosophy, and Doctor of Engineering in Chemical Engineering.

The School of Law offers the degree of Juris Doctor.

The Graduate School of Pharmacy and Allied Health Professions offers the degrees of Master of Science and Doctor of Philosophy.

The Graduate School of Professional Accounting offers the degree of Master of Science in Accounting.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

RESEARCH ACTIVITIES

The facilities of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning take place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

buildings and facilities

MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, the Boston Public Library, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 48 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

Libraries

The University library system consists of the Dodge Library, which is the main library; the Suburban Campus Library at Burlington; the School of Law Library; and three divisional libraries for Physics and Electrical Engineering, Chemistry and Biology, and Mathematics and Psychology, Physical and Recreation Education, and Physical Therapy. There are additional subject collections for the Center of Management Development at Andover, Massachusetts, and the Marine Science Institute at Nahant.

The library collections number 400,000 volumes supplemented by some 333,000 titles in microprint, microfilm, and microfiche forms. The collection includes, in addition, some 3,700 periodical titles, 100,000 documents, and 4,600 sound recordings.

SUBURBAN FACILITIES

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

Marine Science Institute

The Marine Science Institute at Nahant, Massachusetts, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated all year, and is about 20 miles northeast of Boston. Many of the courses at the institute are applicable toward an advanced degree in biology or health science.

Government Center Campus

With the cooperation of the Federal Executive Board, the Department of Political Science offers an entire Master of Public Administration Program at the John F. Kennedy Building in downtown Boston. This program is primarily for individuals employed in federal, state, or local civil services.

Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

the graduate school of arts and sciences

Thirty-five years ago the Department of Chemistry and the Department of Physics inaugurated the first graduate programs at Northeastern. In the succeeding years the creation of degree programs in other departments of the College of Liberal Arts led to the formation of the graduate program of arts and sciences in 1958 and finally the Graduate School of Arts and Sciences in 1963. Ten departments now offer work at the graduate level.

The Master of Arts degree may be earned in economics, English, history, political science, psychology, sociology, and social anthropology. The Master of Science degree is available in biology, chemistry, clinical chemistry, economic policy and planning, mathematics, and physics. The Master of Science in Health Science and the Master of Public Administration degrees are also offered. In addition, there are programs leading to the Doctor of Philosophy degree in biology, chemistry, economics, mathematics, physics, psychology, and sociology.

GENERAL REGULATIONS

The general regulations of the graduate school that follow are minimal requirements shared by the several degree programs. The student is advised to consult the appropriate departmental section for a statement of specific requirements.

Application

All applicants should address inquiries to the Director of the Graduate School of Arts and Sciences. Initial correspondence directed elsewhere may result in valuable time lost in initiating the admissions procedure. Application forms and reference blanks will be mailed to the applicant. This material, together with complete official transcripts, the Graduate Record Examination scores when required, and the results of the Test of English as a Foreign Language, required of all applicants whose native language is not English, should be returned to the Director of the Graduate School of Arts and Sciences. Applications for those desiring assistantships should be submitted no later than March 15; however, some departments have earlier deadlines. Applications received after this date may not be given equal consideration. All necessary supporting documents must be on file with the graduate school office at least four weeks before the date of registration for the quarter in which the student expects to begin his scholastic program. For more detailed information see departmental requirements for admission.

All applicants to the graduate school are strongly urged to take both the aptitude and advanced portions of the Graduate Record Examination. These tests are presently required in biology, English, history, mathematics, psychology, and sociology and anthropology. Applicants for the M.A. in Political Science are required to furnish scores only for the verbal and quantitative aptitude tests. At present the Graduate Record Examination is not required of M.P.A. applicants. At least two letters of recommendation are required of all candidates. In biology, physics, political science (M.A. and M.P.A.), psychology, and sociology and anthropology, three letters are necessary. Candidates for financial awards should so indicate to those supplying references.

Applications for the Graduate Record Examination can be obtained by writing to:

Educational Testing Service
Box 955
Princeton, New Jersey 08540

Applications for the Test of English as a Foreign Language can be obtained by writing to:

Educational Testing Service
Box 899
Princeton, New Jersey 08540

Admission

To be enrolled for graduate work, an applicant must submit a complete official transcript indicating the award of a bachelor's degree from a recognized institution and provide evidence that he is able to pursue creditably a program of graduate study in his chosen field. His scholastic record must therefore show distinction, and his undergraduate program show breadth as well as adequate preparation in the field in which the applicant expects to do advanced work. Admission to the graduate school is for a specific academic quarter. Students who fail to attend must reapply if they wish to do course work in a subsequent quarter. Acceptance to the school is granted upon recommendation of the departmental graduate committee after a review of the completed application. Foreign students who do not receive a graduate award or whose award is insufficient to cover all educational and living expenses must certify that they are able to meet all their expenses while at Northeastern. A visa may not be granted without such certification.

Student Classifications

Regular Student Those students admitted with a bachelor's degree showing a high quality of previous work.

Provisional Student Students whose records do not qualify them for enrollment as regular students. Provisional students must obtain a B

average in the first 12 quarter hours of study for continuation in the degree program.

Special Student Students not matriculated in a degree program. Acceptance as a special student is in no way related to admission into a departmental degree program. However, those special students subsequently admitted into a degree program may apply the first twelve quarter hours of credit earned as a special student toward degree requirements. Special students are expected to maintain a B average in the first 12 quarter hours of study.

Doctoral Student Students admitted to a doctoral program.

Doctoral Degree Candidate Doctoral students who have completed 40 quarter hours of acceptable graduate work and have passed the qualifying examination.

Registration

Students must register within the dates and times listed on the school calendar. The place of registration will be announced prior to each period.

Residence

All work for advanced degrees must be registered for and completed at the University unless approval has been obtained from the director of the graduate school for work taken elsewhere.

Programs of Study

The study load for full-time students is usually four courses per quarter. Part-time students are limited to two courses per quarter unless permission to carry a heavier load is given by the departmental chairman or his designate. Courses in most fields are offered both in the afternoon and evening.

Grading System

The performance of students in graduate courses will be recorded by the instructor by use of the following grades:

A Excellent
This grade is given to those students whose performance in the course has been of very high graduate caliber.

B Satisfactory
This grade is given to those students whose performance in the course has been at a satisfactory level.

C Fair
This grade is given to those students whose performance in the course is not at the level expected in graduate work.

F Failure
This grade is given to those students whose performance in the course is unsatisfactory.

In addition, the following letter designations are used:

I Incomplete without quality designation.
This grade may be given to those students who fail to complete the work of the course.
L Audit without credit.
S Satisfactory without quality designation.
U Unsatisfactory without quality designation.
An S or U grade is used for the first quarter of a two-quarter sequence in which the grade for the second quarter applies to both the first and second quarters of the sequence.

The I grade will be changed to a letter grade when the deficiency which led to the I is made up to the satisfaction of and in the manner prescribed by the instructor in the course, or, in his absence, by the chairman of the department in which the grade is given. The period for clearing such a grade will be restricted to one calendar year from the date of its first being recorded on the student's permanent record.

Students must indicate their preference for auditing a course at registration. No credit will be given for the course. It will, however, appear on the student's transcript. Registration changes from an audit to a graded status, or vice versa, may only be made prior to the first day of classes.

Class Hours and Credits

All credits are entered as quarter hours. A quarter hour of credit is equivalent to three-fourths of a semester hour credit.

Continuity of Program

Students are expected to maintain continuous progress toward a degree. Any student who does not attend Northeastern for a period of one year must apply for readmission.

Withdrawals

In order to withdraw from a course, a student must fill out an official withdrawal form obtained at the Registrar's Office or at the Suburban Campus Office. Withdrawals may be made through the ninth week of the quarter. Students will be withdrawn as of the date on which they fill out the form. Ceasing to attend a class or notifying the instructor does not constitute an official withdrawal.

Changes in Requirements

The continuing development of the graduate school forces frequent revision of curricula. In every new bulletin some improvements are indicated.

When no hardship is imposed on the student because of changes, and when the facilities of the school permit, the student is expected to meet the requirements of the last bulletin. If the student finds it impossible to meet these requirements, the bulletin for the year in which he entered becomes the binding one.

Application for the Diploma

If a commencement card is not filed with the Registrar's Office on or before the applicable date listed in the calendar, there is no assurance that the degree will be granted in that particular year even though all other requirements have been fulfilled.

THE MASTER'S DEGREE

Admission

Specific requirements for each degree program will be found in the appropriate paragraphs for each department.

Academic Requirements

A candidate for the master's degree must complete a minimum of 40 quarter hours of correlated work of graduate caliber and such other study as may be required by the department in which he is registered.

During the first half of the total number of hours of course work required for the degree, the candidate will be expected to maintain a minimum quality point average of 2.5. At the completion of three-fourths of the total number of hours of course work required for the degree, the candidate will be expected to have a quality point average of 2.8. To qualify for the degree, a final average of 3.0, equivalent to a grade of B, must be obtained. This average will be calculated quarterly by the graduate school on the basis of A=4, B=3, C=2, and F=0 and will exclude any transfer credits.

Not more than six quarter hours of repeated courses, additional courses, or permanent I's may be allowed in order to satisfy the requirements for the degree.

Within the above limitations, a required course for which a grade of F is received must be repeated with a grade of C or better, and may be repeated only once. If a grade of F is received in an elective course, that course may be repeated once to obtain a grade of C or better, or another elective course may be substituted for it. If a grade of C is received in a required course, that course may be repeated once to obtain a grade of B or better.

Comprehensive Examination

A final written or oral comprehensive examination may be required. This

examination will be given at least two weeks before the commencement at which the degree is expected.

Thesis

A thesis must show independent work based on original material, be approved by the department graduate committee, and in cases where a department requires a grade, must receive a grade of B or better to be accepted.

Language Requirement

An examination to show evidence of ability in one or more foreign languages is required in some graduate programs. This knowledge is established by an examination which will be administered by the graduate school at least twice yearly.

Transfer Credit

A maximum of 12 quarter hours of credit obtained at another institution may be accepted toward the master's degree provided that the credits transferred consist of A or B grades in graduate level courses, be in the candidate's field, have been earned at a recognized institution, and have not been used toward any other degree. Students should petition the director of the graduate school in writing for all transfer credit. Transfer credit grades may not be used for the purpose of obtaining the academic average necessary for the completion of the degree requirements.

Time Limitation

Course credits earned in the program of graduate study, or accepted by transfer, are valid for a maximum of seven years unless an extension is granted by the Committee of the Graduate School of Arts and Sciences.

THE DOCTOR OF PHILOSOPHY DEGREE

The Doctor of Philosophy degree is awarded to candidates who give evidence of high attainment and research ability in their major field. The degree requirements are administered by committees in charge of each degree program. These committees may be departmental graduate committees or the committee of the graduate school depending upon the nature of the program. It is the responsibility of the chairman of the committee to certify to the Graduate School Office the completion of each requirement for each candidate.

Admission

Each degree program has an established admission procedure for students starting their doctoral work at Northeastern University.

Residence Requirement

Candidates for the Doctor of Philosophy degree must spend the equivalent of at least one academic year in residence at the University as a full-time graduate student. The committee of each degree program specifies the method by which the residence requirement is satisfied.

Qualifying Examination

Students must pass a qualifying examination within time limits set by the committee of each degree program.

Comprehensive Examination

Degree programs may require a comprehensive examination during the time in which a student is a degree candidate.

Course Requirements

The minimum course requirement of 40 quarter hours constitutes the work normally required for a master's degree. The course requirements beyond this in each doctoral program are specified by the committee in charge of the doctoral program.

Dissertation

Each doctoral student must complete a dissertation which embodies the results of extended research and makes an original contribution to the field. This work should give evidence of the candidate's ability to carry out independent investigation and interpret in a logical manner the results of the research. The method of approval of the dissertation is established by the committee in charge of the degree program.

Language Requirement

The foreign language requirement is established by the committee in charge of each degree program.

Final Oral Examination

The final oral examination will be on the subject matter of the doctoral dissertation and significant developments in the field of the dissertation. Other fields may be included if recommended by the examining committee.

This examination will be taken after completion of all other requirements of the degree and must be held at least two weeks prior to the commencement at which the degree is to be awarded.

Transfer Credit

Approval for transfer credit may be given by the committee in charge of the degree program.

Time Limitation

After the establishment of degree candidacy, a maximum of five years will be allowed for the completion of the degree requirements.

Registration

All students must register for course work or dissertation as approved by their advisers or the departmental registration officer. After the first registration for doctoral work, registration must be continuous unless withdrawal is allowed by the committee in charge of the degree program. Students must be registered for dissertation during the quarter in which they take the final oral examination.

INTERDISCIPLINARY PROGRAMS

Some graduate students may wish to pursue doctoral programs which involve substantial work in two or more departments. To meet this need, an interdisciplinary program may be established which corresponds in scope and depth to doctoral standards, but does not agree exactly with the individual departmental regulations. For such possibilities, the following option is available:

Admission

Application for admission to interdisciplinary doctoral study consists of the submission of a carefully thought-out written proposal describing the areas of proposed study and research. The proposal may be a part of the initial application for admission to graduate study at Northeastern University, or it may be submitted by a student already enrolled. It may be directed to a doctoral degree-granting department or to the director of the graduate school who forwards it to the appropriate department. In either case, admission to interdisciplinary doctoral study requires favorable recommendation by the sponsoring doctoral degree-granting department and approval by authorized representatives of the graduate study committees of the departments appropriate to the disciplines covered by the applicant's proposal. The sponsoring department becomes the registration base of the student.

Formation of Interdisciplinary Committee

A student who has been accepted for interdisciplinary study must obtain the consent of an adviser who will direct his doctoral dissertation. This adviser, who may or may not be a member of the registration department, will be chairman of the interdisciplinary committee for this student. A second member will be appointed from the registration department by its chairman. These two members will obtain one or more additional members or request the director of the graduate school to do so. At least two departments must be represented on the committee and a majority of the

committee must come from doctoral degree-granting departments. The chairman of the registration department will notify the director of the graduate school of the membership of the committees as soon as arrangements are complete.

Duties of Interdisciplinary Committee

A member of the interdisciplinary committee who is also a member of the registration department will serve as the registration officer to approve the course registration for the student. A copy of the approved course registration must also be filed with the other committee members and with the graduate study committee of the registration department.

The interdisciplinary committee will be responsible for the administration of the qualifying examination, language examination, approval of the dissertation, and comprehensive examination. This committee must also certify to the registration department the completion of the requirements for the award of the doctoral degree.

The interdisciplinary committee must assure that the program of the student represents standards comparable to those of the registration department and that the program is not so broad that it has inadequate depth in any area.

The program of the student may be reviewed at any time by the director of the graduate school to determine whether objectives of the program are being met.

financial information

FINANCIAL OBLIGATIONS

Tuition

Master's Degree Candidates

The tuition rate for 1976 - 1977 is $67 per quarter hour of credit.

Doctoral Candidates

Tuition for full-time doctoral candidates in 1976 - 1977 is $67 per quarter hour of credit. Doctoral candidates actively utilizing the resources of the University in their Ph.D. dissertation are charged an additional $600 per quarter. Those doctoral candidates registered for dissertation work performed off campus are charged $200 in addition to tuition charges each quarter, and those doctoral candidates who are no longer actively utilizing University resources are charged a continuation fee of $50 per quarter.

Tuition statements are mailed to students by the Bursar's Office and are payable by check to Northeastern University.

Fees

An application fee of $15 is charged all students when they apply for the first time in the graduate school at Northeastern.

Other fees include a charge of $10 for late payment of tuition; a fee of $25 for all degree candidates, payable before commencement by the applicable date listed on the academic calendar.

For full-time students there is a charge of $12.50 per quarter for the services available in the Student Center. The fee for teaching assistants and research fellows is $6.25 each quarter. All part-time students on the Huntington Avenue campus are charged $.75 a quarter.

All full-time students will pay a nonrefundable University health services fee of $120 each year. This fee will provide Blue Cross-Blue Shield coverage and entitle the student to the medical care furnished by the University Health Services. Tuition and fees are subject to change without notice.

All financial obligations to the University must be discharged by graduation.

Tuition rates and fees are subject to revision by the Board of Trustees at any time.

Refunds

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal form filed by the student. Nonattendance does not

constitute official withdrawal. Questions regarding refunds should be discussed with the Bursar's Office.

Refunds will be granted in accordance with the following schedule:

Official Withdrawal Filed Within	Amount of Refund Percentage of Tuition
First week of quarter	100
Second week of quarter	75
Third week of quarter	50
Fourth week of quarter	25

FINANCIAL AID

Northeastern University has available fellowships and assistantships for full-time students who are working toward the master's or doctor's degree. Candidacy for these awards may be established by completing the relevant section of the application for admission. Those students already enrolled should consult their departmental adviser.

Teaching Assistantships

Teaching assistantships allowing remission of tuition and a stipend are available in all departments. Holders of such awards devote half time to academic assistance directly related to the teaching function and the balance to course work.

Graduate Administrative Assistantships

Some University departments offer the graduate student an opportunity for remission of tuition and a stipend in return for half time spent in assisting with nonteaching, administrative duties.

Tuition Assistantships

Many departments provide remission of tuition to full-time students assisting eight hours a week in the administrative work of the department. These awards are normally given to students in the first year of graduate work.

Research Fellowships

A number of departments offer research fellowships including N.I.H., N.S.F., and N.D.E.A. carrying a stipend and remitting tuition. Certain of these grants require half-time work on research in the department, with the remaining time devoted to course work. Others provide for full-time work on research used for a thesis or dissertation.

Martin Luther King, Jr., Scholarships

A limited number of full- and part-time Martin Luther King, Jr., Fellowships are available. These scholarships provide for remission of tui-

tion and all fees, and are awarded to qualified black students on the basis of financial need. Additional information and application forms are available from the Office of Financial Aid.

Robert A. Feer Scholarship

This scholarship is awarded yearly to the outstanding candidate for the Master of Arts degree in History. The scholarship was established in memory of Professor Robert A. Feer who was a member of the Department of History from 1963 to 1970.

Appointments

Appointments to fellowships and assistantships are ordinarily announced no later than April 15 for the following academic year or summer. Appointments are for a maximum of three quarters and are not automatically renewed. Students who hold assistantships and research fellowships are expected to devote full time to their studies and the duties of the award. They may not accept outside employment without the consent of their faculty adviser and the director of the graduate school.

Acceptance Conditions

Northeastern University, which is a member of the Council of Graduate Schools of the United States, subscribes to the following resolution of the Council:

Acceptance of an offer of financial aid (such as a graduate scholarship, fellowship, traineeship, or assistantship) for the next academic year by an actual or prospective graduate student completes an agreement which both student and graduate school expect to honor. In those instances in which the student accepts the offer before April 15 and subsequently desires to withdraw, the student may submit in writing a resignation of the appointment at any time through April 15. However, an acceptance given or left in force after April 15 commits the student not to accept another offer without first obtaining a written release from the institution to which a commitment has been made. Similarly, an offer by an institution after April 15 is conditional on presentation by the student of the written release from any previously accepted offer.

Dormitory Proctorships

A number of proctorships for men in dormitories on or near the Huntington Avenue campus are available each year. Appointments carry a minimum compensation of room and board. Further information and application forms may be obtained from the Office of University Housing.

National Direct Student Loan

This program is available to students who are carrying at least one-half

the normal academic work load, are accepted as degree candidates, and who show evidence of financial need.

The Federal maximum which a graduate student may borrow while pursuing a post-baccalaureate degree is $5,000.

Repayment and interest on these loans do not begin until nine months after the student ceases to carry at least a half-time academic load at an institution of higher education. The repayment of principal may be extended over a 10-year period with the interest at the rate of three percent per annum. Repayment may be deferred up to a total of three years while a borrower is serving as a Peace Corps or VISTA volunteer.

Guaranteed Student Loan Program

Under this program, students who are matriculated degree candidates, enrolled for at least one-half the normal academic work load, may borrow from a participating bank or other financial institution. Terms and conditions vary from state to state, but a student generally may borrow up to $1,500 a year (the law allows a maximum of $2,500 per year) depending on financial need. The Federal government pays the interest while the student is in school if the student is eligible for interest subsidy.

The student must have submitted, through the College Scholarship Service, a Parents' Confidential Statement; or if he has been declared financially independent by the Financial Aid Office, a Students' Confidential Statement. These forms are available from local banks or the Education Office of your state government. Additional information and necessary application forms for Massachusetts residents are available from the Financial Aid Office.

The federal aid programs listed above are available to citizens and permanent residents of the United States.

fields of study

The departmental sections that follow list courses available to a student during the typical period of attendance required to obtain a degree. The quarter in which a specific course will be offered will be found in the course announcement made available in May for the summer quarter and in June for the following academic year.

biology

Professors
Francis D. Crisley, Ph.D.
Janis Z. Gabliks, D.D.S., Ph.D.
Charles Gainor, Ph.D.
Abdul-Karim Khudairi, Ph.D.
Nathan W. Riser, Ph.D., Director, Marine Science Institute

Associate Professors
Charles H. Ellis, Jr., Ph.D.
Helen Lambert, Ph.D.
Charles A. Meszoely, Ph.D.
M. Patricia Morse, Ph.D.
Joseph V. Pearincott, Ph.D.
Fred A. Rosenberg, Ph.D.
Ernest Ruber, Ph.D.
Henry O. Werntz, Ph.D., Chairman

Assistant Professors
William Hartner, Ph.D.
Dale F. Levering, Jr., Ph.D.
Daniel Scheirer, Ph.D.
Phyllis R. Strauss, Ph.D.

THE MASTER OF SCIENCE DEGREE
Full-Time Program

THE MASTER OF SCIENCE IN HEALTH SCIENCE DEGREE
Part-Time Program

Admission

In addition to the requirements listed on page 22 applicants should have a background which includes one year each of organic chemistry, physics and mathematics, and the six quarter courses of the biology undergraduate core curriculum or their equivalents. Students admitted with deficiencies should remove them during the first 20 quarter hours of graduate work.

Program

Forty-six quarter hours of academic work are required. A candidate for either degree is expected to take forty hours of course work including four hours of seminar. Transfer credits will be accepted only from those schools offering graduate programs in biology. Application for such credit should be made in writing to the Graduate Director of the respective program during the first quarter following the student's assignment to an academic adviser. Other limitations on transfer credit are listed on page 27. Graduate courses in departments other than Biology will be accepted for credit up to a limit of 12 quarter hours, including those credits previously accepted as transfer credits, upon written recommendation from the student's adviser to

the graduate director for final approval.

During his tenure, in addition to the above course requirements, each student pursuing work toward the master of science in Biology must enroll for a minimum of six credits of work in 18.990, Special Topics in Biology, or 18.991, Research for the Master of Science degree. After initial election of either 18.990 or 18.991 the student must register for either of these courses for each quarter until the work is completed. Work in 18.990, Special Topics in Biology, is pursued under the supervision of an individual faculty member, by mutual agreement. It may take the form of a comprehensive, critical review of the literature in a specialized area and/or a specific program of experimental work on a single topic. If experimental work has been elected under 18.990 it may later be expanded, with permission of the department graduate committee, into a master's thesis with a topic and adviser and a committee of three members approved by the departmental graduate committee. Grades in 18.990 or 18.991 are recorded as "Satisfactory" (or "Unsatisfactory") until all work is completed, culminating in either a comprehensive, well-written report — which must be reviewed by the department graduate committee — or a thesis. For the latter a final oral examination on the thesis is required. The department encourages the pursuit of a thesis wherever feasible.

The program leading to the Master of Science in Health Science degree is designed for part-time students who may progress according to their abilities, the time available, and the need or desire to extend their education into interdisciplinary work involving biology or allied areas such as the health sciences. Students may elect to substitute six quarter hours of course work credit for the required 18.990, Special Topics in Biology or 18.991, M.S. Thesis. Those students electing the course option must take a comprehensive examination in the last six-month period of their program, similar to that required of non-thesis students in the M.S. in Biology degree. If their schedules permit, students in the M.S. in Health Science program may carry out their work on a full-time basis.

THE DOCTOR OF PHILOSOPHY PROGRAM

Admission

Applicants who will have a master's degree or its equivalent at entry may be considered for direct admission to the doctoral program. Those who will not may be considered only after admission to the master's program, and, after satisfactory completion of 30 quarter hours of graduate study, may then be considered for admission to the doctoral program. In addition, a student must present evidence of the willingness of a faculty member of the graduate faculty to serve as the Ph.D. thesis adviser.

Residence Requirement

After admittance to the doctoral program, the student may satisfy the residence requirement by one year of full-time graduate work or by two

years of half-time graduate work. However, a student should expect to spend at least two years or the equivalent in full-time study.

Degree Candidacy

Degree candidacy is established in accordance with the general graduate school regulations.

Qualifying Examination

Students entering the doctoral program will be expected to have had the equivalent of an M.S. degree at Northeastern before taking their qualifying examination. Students who have been accepted into the doctoral program must take their qualifying examination by the end of three quarters at Northeastern University. The student will be expected to demonstrate an advanced knowledge of biological concepts. The examination will be oral, given by a standing committee, and last approximately two hours. Eligibility to continue in the program toward the Doctor of Philosophy degree is contingent upon satisfactory performance on the qualifying examination.

Comprehensive Examination

The comprehensive examination requirement will be fulfilled by two written examinations, one in the major area of specialization and the other in closely related areas. The candidate may apply through his adviser after completing the foreign language requirement and at least one quarter prior to the oral examination.

Course Requirements

After the establishment of candidacy, any further course requirements will be established by the dissertation adviser and approved by the departmental graduate committee.

Dissertation

Arrangements for a dissertation adviser are made at the time of admittance into the Ph.D. program. Research for the Ph.D. is performed under the guidance of the dissertation adviser. The adviser also serves as the chairperson of the doctoral committee which must consist of at least 5 members. The research proposal and the doctoral committee must be approved by the Department Graduate Committee. The doctoral committee must approve the dissertation before the degree may be conferred.

Language Requirement

Ability to read and translate biological literature in one foreign language must be established by the candidate. In order to maximize the usefulness of this language as a tool of research, the student should take the language

examination as early as possible. The examination will be administered by the Department of Biology, or in certain cases, by the Modern Language Department. French, German, and Russian are the three most important foreign languages for the biologist. Students will be expected to choose one of these languages for their examination, but another language may be substituted where there is significant literature in the area of interest.

Tool of Research

A tool of research is required in addition to the above language. This requirement may be fulfilled through either passing a second foreign language examination in a language in which there is significant literature, or completion of a program in the general principles of statistics, biometry, and/or computer programming.

Final Oral Examination

This examination will be held in accordance with the general regulations of the graduate school.

INTERDISCIPLINARY PROGRAMS

Admission

Application and credentials for admission to interdisciplinary programs involving the Biology Department, where this department is clearly the department of registry, as described under "General Regulations," should be submitted as described under the heading of "Admission" in the section "The Doctor of Philosophy Program" for biology. The interdisciplinary committee will consist of at least five members. The composition of this committee will be determined by mutual consent between the departments involved, but will have at least three members from the Biology Department if the dissertation adviser is from this department. Upon admission, suitable interdisciplinary course requirements will be determined by the interdisciplinary committee.

Qualifying Examination

Students accepted into the program will normally be expected to complete the qualifying examination by the end of three quarters at Northeastern University. At least five areas of study will be covered by the qualifying examination, at least three of which will be oral examinations chosen by the candidate from the following areas: biochemistry, botany, ecology, genetics, microbiology, physiology, and zoology. The remaining components of the examination will be specified and evaluated by the other participating department. With the exceptions of the procedures for admission and examinations for qualification, the remaining requirements and procedures are as specified under "The Doctor of Philosophy Program" for biology.

DESCRIPTION OF COURSES

18.804 Lower Invertebrates (4 q.h.)
Taxonomy, morphology, embryology, and life histories of acoelomate phyla (Marine Science Institute).

18.805 Coelomate Invertebrates (4 q.h.)
Biology of annelids, arthropods, molluscs and echinoderms (Marine Science Institute).

18.806 Malacology (4 q.h.)
Functional morphology, embryology, systematics, and ecology of the major groups of molluscs. *Prep. Invertebrate Zoology.*

18.809 Mammalogy (5 q.h.)
Phylogeny, anatomy, physiology, behavior, reproduction, population dynamics, and natural history of the mammals. The course will include student presentation of the recent advances in mammalogy. Field collection and laboratory preparation and study of specimens will be included. *Prep. Comparative Anatomy of Embryology.*

18.810 Ichthyology (4 q.h.)
Natural history and systematics of fishes, with emphasis on marine species (Marine Science Institute). *Prep. Comparative Anatomy or Vertebrate Zoology.*

18.813 Dynamics of Aquatic Ecology I (3 q.h.)
Chemical, physical and biotic features influencing coastal, lake and stream communities. Lectures. *Prep. 18.134 or 18.834 or equivalent.*

18.814 Dynamics of Aquatic Ecology II (3 q.h.)
One hour of lecture and one full day (7 hours) of laboratory-field work. *Prep. 18.813.*

18.818 Ecology of Salt Marshes (3 q.h.)
Survey of fauna and flora, environmental factors affecting them and current biological and social problems associated with this habitat. This course will meet for 2 lectures of 1½ hours each and 1 full day of laboratory for 6 weeks during the summer quarter. *Prep. 18.134 or 18.834 or equivalent.*

18.819 Principles of Systematics (3 q.h.)
Codes of nomenclature. Biological principles basic to methodology of the preparation of monographs and of faunas and floras.

18.823 Human Ecology (4 q.h.)
Parameters of the human ecological niche, man's effect on them, and their consequences for him.

18.825 Plant Nutrition and Metabolism (4 q.h.)
Mineral nutrition, photosynthesis, metabolic pathways, and translocation in higher plants.

18.826 Plant Growth and Reproduction (4 q.h.)
Plant hormones, growth, development, and physiology of reproduction. *Prep. 18.825.*

18.827 Physiology of Plant Growth and Development (2 q.h.)
A general coverage of the internal and environmental factors that influence the physiology of plant growth and development. The mechanisms by which plant growth hormones regulate the physiology of plants will be discussed with particular emphasis on the roles of auxins, gibberellins, cytokinins, and phytochrome. *Alternates yearly with 18.833.*

18.830 Marine Algae (4 q.h.)
Systematics, life histories, and ecology of marine algae, with emphasis on the flora of the Gulf of Maine (Marine Science Institute).

18.831 Plant Morphogenesis (4 q.h.)
The origin of form, experimentally controlled development, and external and internal factors that govern development of form. Plant tissue, organ, and cell culture techniques employed in the study of morphogenetic processes. *Prep. 18.237.*

18.833 Photosynthesis (2 q.h.)
A general discussion of the biochemistry and physiology of photosynthesis with particular emphasis on recent discoveries in electron transport, chloroplast structure, and CO_2 assimilation. The evolution and requirements of photosynthesis will also be discussed. *Prep. 18.827. Alternates yearly with 18.827.*

18.834 Environmental and Population Biology (2 q.h.)
Physico-chemical factors influencing and influenced by organisms. Interactions among individual organisms and among species. Students will participate in lectures and laboratories given for 18.134. Individual work on specialized aspects of ecology will be assigned. *Prep. One year of General Biology, including plant and animal biology. Open only to graduate students completing deficiencies in entrance requirements.*

18.835 Genetics and Developmental Biology (2 q.h.)
Elaboration of the classic laws of heredity. Cytogenetics. Chemical basis of heredity. Selected examples of the development of form and function. Students will participate in lectures and laboratories given for 18.135 and will be assigned extra individual work. *Prep. General Biology. Open only to graduate students completing deficiencies in entrance requirements.*

18.836 Cardiovascular Physiology (3 q.h.)
Physiology of blood cells, anemia, polycythemia immunity and allergy. Electrophysiology of the heart, cardiac cycle, EKG, hemodynamics, capillary dynamics, pulmonary circulation, cardiovascular reflexes, cardiac output and venous return. Cardiac failure, coronary circulation, atherosclerosis, hypertension, cerebral circulation, circulatory shock.

18.837 Cardiovascular Physiology Laboratory (1 q.h.)
Three hours of laboratory study per week. *Prep. 18.836.*

18.838 Animal Nutrition (2 q.h.)
Detailed consideration of organic and inorganic nutritional requirements of man and selected animals. Digestion, absorption, and metabolism of nutrient materials. Role of vitamins, minerals, and trace elements in metabolism. Variation in nutritional

needs among normal individuals and in various physiologic and genetic pathologies. Evaluation of food additives and of permissible levels of toxic materials in food.

18.840 Comparative Physiology of Regulatory Mechanisms (2 q.h.)
Principles and selected examples of physiological response to environmental variation. *Prep. Basic Physiology.*

18.842 Vertebrate Endocrinology (2 q.h.)
Principles of hormonal regulation of physiological processes in vertebrates, mechanisms of hormone action, neuro-endocrine relationships. *Prep. Physiology.*

18.845 Physiological Ecology (2 q.h.)
Study of biological and chemical mechanisms involved in adaptation; homeostasis and its regulation, salt and water metabolism; respiratory and circulatory control systems; adaptation versus acclimation. Control systems within the body versus set points. *Prep. College Biology, Organic Chemistry.*

18.847 Environmental Law (2 q.h.)
The kinds of scientific information required for implementation of the legal and political aspects of environmental management. The role of the scientist as an expert witness. Scientific and legal predictability. Analyses of suitable dynamic models and case law with the goal of improving the results of legal, political, and scientific decisions bearing upon remedial environmental management. *Prep. Biology core and first course in physiology, e.g., 18.158 and 18.159.*

18.852 Advanced Developmental Biology (3 q.h.)
Analysis of development at the biochemical and cellular levels. Nucleic acid and protein synthesis, gene action and differentiation, cell-cell interactions, mechanisms of animal morphogenesis. 3 hrs. of lecture. *Prep. 18.135, 18.136 or consent of the instructor.*

18.853 Advanced Developmental Biology Laboratory (2 q.h.)
Analysis of the fundamental problems of development through experimental techniques. Culture of vertebrate and invertebrate embryos; microsurgical analysis of morphogenesis; biochemistry of development, cell-cell interactions; organ and tissue culture will be studied. 5 hours of laboratory per week. *Prep. 18.852 or consent of the instructor.*

18.857 Advanced Mammalian Physiology (4 q.h.)
Intensive study of the circulatory, respiratory, digestive, excretory, reproductive, nervous and endocrine systems in mammals, with emphasis on laboratory procedures and surgical techniques used with living animals — chiefly, the rat. *Prep. Background in Physiology, consent of the instructor.*

18.860 Cell Biophysics and Biochemistry I (5 q.h.)
Biogenesis and ultrastructure of the cell considered together with the biophysical procedures and biochemical patterns used in the study of cellular and tissue components. Lecture only. *Prep. Organic Chemistry, General Biology, Biochemistry and Cell Biology.*

18.861 Cell Biophysics and Biochemistry II (5 q.h.)
Laboratory portion of the course, 18.860. *Prep. Consent of the instructor.*

18.903 Environmental Microbiology (4 q.h.)
The microbial environment and ecology of the cell. Interactions between microbial populations, stressing soil and fresh-water associations. *Prep. 18.220 or equivalent.*

18.907 Food Microbiology (2 q.h.)
Microbiology of food with emphasis on the pathogenic types and their interactions with other groups indigenous to food. *Prep. 18.220 or equivalent.*

18.908 Food Microbiology Laboratory (2 q.h.)
Detection, quantification, and isolation of microorganisms and their products of significance in food with emphasis on the pathogenic types. *Prep. 18.907 (may be taken concurrently).*

18.909 Animal Virology (4 q.h.)
Physical and chemical properties of viruses. Viruses as intracellular parasites. Viral replication and genetics, host-virus interaction, pathogenesis, diseases, tumor viruses, and serological reactions. Laboratory sessions will consist of demonstrations emphasizing use of animals, eggs and animal cell cultures for cultivation, isolation, and identification of viruses. *Prep. 18.220 and 18.242 or their equivalent and Biochemistry.*

18.910 Microbial Genetics (3 q.h.)
Principles of bacterial and bacteriophage genetics. Nature of variation and inheritance and the mechanisms of exchange of genetic material. *Prep. 18.220 or equivalent.*

18.911 Microbial Genetics Laboratory (2 q.h.)
Origin, isolation, and characterization of mutants. Mechanisms of genetic exchange in bacteria and bacteriophage. *Prep. 18.910 (may be taken concurrently).*

18.914 Medical Mycology (2 q.h.)
Morphological, pathological, and epidemiological factors of pathogenic opportunistic and common fungal contaminants from human sources. *Prep. 18.220 and 18.224 or equivalents.*

18.915 Medical Mycology Laboratory (2 q.h.)
Basic methodology for demonstration and isolation of fungi in clinical specimens. Identification on morphologic and biochemical basis. *Prep. or co-requisite 18.914.*

18.920 Industrial Microbiology (3 q.h.)
Microorganisms and methods employed in production of products of economic and medical importance, decomposition of wastes, and control of desirable and unwanted processes and biodeterioration. Fermentation processes emphasized. *Prep. 18.240 or equivalent or consent of instructor.*

18.921 Industrial Microbiology Laboratory (2 q.h.)
Laboratory and discussion seminar sessions devoted to the study of selected commercial processes.

18.936 Cell Biology (2 q.h.)
Basic chemical and physical processes of cells related to their fine structure; oxidative and intermediary metabolism; photosynthesis, membrane phenomena; movement; chemical and physical processes of prokaryotic and eukaryotic cells. Students will participate in lectures and laboratories given for 18.136. Extra individual work will be assigned. *Prep. General Biology, college physics, and organic chemistry. Only open to graduate students completing deficiencies in entrance requirements.*

18.940 Microbial Biochemistry (4 q.h.)
Study of the enzymatic reactions, intermediate products, and metabolic pathways involved in carbohydrate, protein, and nucleic acid metabolism by microorganisms. *Prep. 18.220 and 18.240 or equivalents, and Biochemistry.*

18.980 Seminar (1 q.h.)
Various topics and newer developments in botany, microbiology, physiology, and zoology covered in depth. Student presentations are emphasized.

18.990 Special Topics in Biology (credit variable)
Special study of a selected topic under direction of a faculty member. Topic and direction of study to be arranged with the faculty member supervising the study.

18.991 M.S. Thesis (credit variable)
Research methods of some special field and their application to a specific problem, under direction of a faculty member.

18.992 Special Investigations in Biology (credit variable)
Laboratory studies on a topic not directly related to research being pursued for a thesis or dissertation.

18.993 Biological Electron Microscopy (4 q.h.)
Techniques of electron microscopy applied to biological materials. Specimen preparation, fixation, thin-sectioning, staining, operation of electron microscope, photographic techniques, interpretation of electron micrographs. Student seminars and project required. *Prep. Consent of the instructor.*

18.995 Ph.D. Dissertation
Original research in depth, representing a significant contribution of new biological knowledge, and a written dissertation thereon, under the supervision of a faculty member.

90.821 Biochemistry I (2 q.h.)
Discussion of the structures and chemistries of carbohydrates, proteins, lipids, nucleic acids, and selected cofactors. *Prep. One year Organic Chemistry.*

90.822 Biochemistry II (2. q.h.)
Bioenergetics, enzymes and enzyme kinetics, intermediary metabolism, including carbohydrate catabolism, tricarboxylic acid cycle, electron transport, and oxidative phosphorylation. *Prep. Biochemistry I (90.821).*

90.823 Biochemistry III (2 q.h.)
Continuation of intermediary metabolism from Biochemistry II, or 73.842, including

lipid, protein, and nucleic acid metabolism, photosynthesis, and cell regulation. *Prep. Biochemistry II (90.822).*

The following courses have been reviewed by the Biology Department Graduate Committee and may be taken for graduate credit. No more than twelve hours of courses outside of the 18.000 and Biochemistry courses may count toward the Master of Science degree in Biology or the Master of Science degree in Health Sciences.

73.814 Concepts in Pharmacology I (2 q.h.)
Selected areas of pharmacology are examined in depth with special reference to interactions of drugs and other chemical agents with biological systems. Emphasis is placed on biochemical mechanisms, experimental design, evaluation of data utilizing conventional statistical procedures, and techniques employed in pharmacological evaluations. Alternates yearly with 73.816.

73.815 Concepts in Pharmacology II (2 q.h.)
Continuation of 73.814.

73.816 Concepts in Toxicology I (2 q.h.)
Concepts of modern toxicology in which emphasis is placed on biochemical mechanisms underlying the toxicological action of drugs and other chemical substances upon biological systems. Selected topics in toxicology, including acute, subacute, and chronic effects of drugs in the experimental animal. Consideration of the predictive value of animal studies for drug effects in man. Alternates yearly with 73.814.

73.817 Concepts in Toxicology II (2 q.h.)
Continuation of 73.816.

01.952 Industrial Hygiene (2 q.h.)
Factors in the industrial environment that adversely affect the health, comfort, and efficiency of the worker. Industrial surveys, and application of engineering principles to control of dust, toxic metals, gases and vapors, organic compounds, radiation, pressure, temperature, and humidity.

01.957 Air Pollution Science (2 q.h.)
Theory and practice related to engineering management of air resources, control of gaseous emission, investigation and study of air pollution, sampling and analysis methods.

11.872 Radiation Biology and Health Physics (2 q.h.)
Prep. consent of the instructor.

All undergraduate biology courses in the series designated 18.200-18.300 are available for graduate credit. Please consult the undergraduate or other appropriate bulletin for course details.

18.208	**Comparative Vertebrate Anatomy**	5 q.h.
18.209	**Developmental Anatomy**	5 q.h.
18.210	**Invertebrate Zoology**	5 q.h.

18.211	**Parasitology**	4 q.h.
18.212	**Vertebrate Paleontology**	4 q.h.
18.220	**General Microbiology**	5 q.h.
18.227	**Animal Histology**	4 q.h.
18.228	**Histological Technique**	3 q.h.
18.231	**Lower Plants**	4 q.h.
18.232	**Higher Plants**	4 q.h.
18.234	**Plant Anatomy**	4 q.h.
18.235	**Economic Botany**	4 q.h.
18.236	**Horticulture**	4 q.h.
18.237	**Introduction to Plant Physiology**	5 q.h.
18.238	**Local Flora**	4 q.h.
18.239	**Terrestrial Ecosystems of North America**	4 q.h.
18.240	**Microbial Physiology**	4 q.h.
18.242	**Medical Microbiology**	4 q.h.
18.245	**Serology-Immunology**	3 q.h.
18.246	**Serology-Immunology Laboratory**	2 q.h.
18.248	**Marine and Freshwater Microbiology Laboratory**	2 q.h.
18.249	**Marine and Freshwater Microbiology**	2 q.h.
18.251	**Comparative Animal Physiology**	4 q.h.
18.252	**Vertebrate Physiology I**	3 q.h.
18.253	**Vertebrate Physiology II**	3 q.h.

chemistry

Professors
Karl Weiss, Ph.D.
Chairman
Bill C. Giessen, Dr. Sc. Nat.
Barry L. Karger, Ph.D.
Albert H. Soloway, Ph.D.
Alfred Viola, Ph.D.

Associate Professors
David M. Howell, Ph.D.
Conrad M. Jankowski, Ph.D.
Elmer E. Jones, Ph.D.
Philip W. LeQuesne, Ph.D.
John L. Roebber, Ph.D., Executive Officer
Robert N. Wiener, Ph.D.

Assistant Professors
Thomas F. Brennan, Ph.D.
Thomas R. Copeland, Ph.D.
Geoffrey Davies, Ph.D.
Claude Eon, D. es Sci.
Arthur M. Halpern, Ph.D.
James E. Quick, Ph.D.
William M. Reiff, Ph.D.

Admission

In addition to the admission requirements listed on page 22 an applicant must have completed not less than four full-year chemistry courses of the level required of an undergraduate major in chemistry. These must include organic, physical, and analytical chemistry. Admission policy favors those who have taken more chemistry than these minima. In addition, one year each of college physics and calculus are required, and further work in these subjects is desirable.

These admission requirements may be modified to accommodate applicants who have taken fewer courses than indicated above, but who have outstanding records and a strong interest in chemical or interdisciplinary studies. See also the description of interdisciplinary programs.

DEGREE REQUIREMENTS

Part-Time Program Leading to M.S. Degree

This program consists of a total of 40 quarter hours of credit in graduate course work, of which 32 credits must be taken in chemistry graduate courses numbered between 12.821 and 12.899. Eight additional credits may be taken in any graduate courses for which the student has the necessary prerequisites. The student's program must include the following core courses in the four areas of chemistry:

(a) Four credits of analytical chemistry. These may be chosen from 12.821, 12.822, 12.823, 12.831 and 12.833.
(b) Four credits of inorganic chemistry. These will normally be the 12.841 and 12.842 sequence.
(c) Four credits of organic chemistry. These may be either the 12.861 and 12.862 sequence or the 12.864 and 12.865 sequence.
(d) Four credits of physical chemistry. These may be either the 12.881 and 12.882 sequence or the 12.885 and 12.886 sequence. Note that 12.881 and 12.885, by themselves, are not sufficient.

In cases of unusual preparation, more advanced courses may be substituted within the given subdiscipline.

Full-Time Program

Master's Degree

The normal full-time program consists of a total of 40 quarter hours of graduate credit in courses, seminars, research, and a thesis based on this research. Each student is required to take at least 24 quarter hours of credit in graduate chemistry courses numbered between 12.821 and 12.899. Up to 4 quarter hours of graduate courses in physics or mathematics may be substituted. At least one two-quarter sequence of courses must be taken in three out of the four areas of chemistry. These sequences would normally be chosen from the following core courses:

(a) Analytical Chemistry — 12.821 and 12.831 or 12.823 and 12.833.
(b) Inorganic Chemistry — 12.841 and 12.842
(c) Organic Chemistry — 12.861 and 12.862
(d) Physical Chemistry — 12.881 and 12.882 or 12.885 and 12.886.

A minimum of 6 hours, but no more than 14 quarter hours of credit may be assigned to 12.991, Research and Thesis for the Master of Science degree. Each student is required to attend 12.990, Seminar, in each term. One credit is assigned to a student for each term in which he conducts a seminar, up to the maximum of 2 credits.

DOCTOR OF PHILOSOPHY DEGREE

The doctoral program in chemistry may be pursued only in residence. The additional requirements beyond those of the master's degree are designed to demonstrate superior proficiency in original research, including technical reading ability in a foreign language and familiarity with current advances in one of the main divisions of chemistry.

Residence Requirement

The residence requirement is satisfied after one year of full-time

graduate work or two years of half-time work. If a student holds a teaching assistantship which occupies one half of his time, his residence requirement is being discharged at half rate. Other arrangements require faculty approval. If a candidate has a research fellowship which supports his research for the doctoral dissertation, his residence requirement is discharged at full rate. Normally, the equivalent of two years of work after establishment of doctoral candidacy is necessary to complete research.

Degree Candidacy

Degree candidacy is established in accordance with the general graduate school regulations.

Qualifying Examination

Qualifying examinations are offered in the fields of analytical, inorganic, organic, and physical chemistry. There are eight examinations offered each year in each field. A student must pass four of these.

A student is eligible to take the qualifying examination if:

(a) he has entered with a bachelor's degree and has achieved a 3.0 average in eight courses taken in the first year of residence. Two of the eight graduate courses may be in physics or mathematics, the remaining courses must be numbered between 12.821 and 12.899;

(b) he has been admitted to the doctoral program with an awarded master's degree;

(c) he is a part-time student who has petitioned the department after having completed at least sixteen credits of graduate courses which include fulfillment of three of the four distributional requirements listed for the part-time program. A 3.0 average is required for all courses taken.

Students in category "a" must pass the qualifying examinations by July 1 of their second year of residence. Students in category "b" must pass the qualifying examinations by July 1 of their first year of residence. Students in category "c" will have the conditions set at the time their petition is approved.

Course Requirements

A candidate is normally required by his faculty adviser to do some course work beyond the 40 quarter hour minimum. The number and nature of these courses are individually determined for each candidate.

Dissertation

In most cases, arrangements for a dissertation adviser will have been made before the completion of the qualifying examination. If not, such

arrangements must be made as soon as possible after degree candidacy has been established. The dissertation adviser directs the research for the dissertation and serves as chairman of the dissertation committee, which must approve the dissertation before the degree may be conferred.

Language Requirements

Proficiency must be demonstrated in a foreign language as specified by the departmental graduate committee in accordance with the general graduate school regulations. French, German, and Russian are the acceptable foreign languages. Normally, proficiency is demonstrated by taking examinations administered by the Chemistry Department.

Final Oral Examination

This examination will be held in accordance with the graduate school regulations.

AREAS OF ADVANCED STUDY AND RESEARCH

Analytical Chemistry

The general areas of active research include separation science, application of analytical methods to a wide range of problems of social relevance, and research in theoretical and applied analytical techniques such as electroanalytical chemistry, atomic absorption, and related areas.

Inorganic Chemistry

Research in inorganic chemistry is largely concentrated on the structure and properties of transition elements and their compounds. Current investigations range from solid state studies to the thermodynamics and mechanism of reactions in solution. The application of inorganic chemistry in the field of forensic science is also under investigation.

Organic Chemistry

Research in the organic chemistry division is concentrated in the areas of organic synthesis, organic reaction mechanisms and natural products, and phytochemistry.

Physical Chemistry

The physical chemistry division has active research programs in the areas of photophysics, fluorescence spectroscopy, solution and gas phase photochemistry, molecular spectroscopy, physical solid state chemistry including X-ray diffraction, and theoretical studies of molecular systems.

Research Facilities and Equipment

The main facilities of the department are located in Hurtig Hall. Substantial additional space and equipment are available in the Institute of Chemical Analysis, Applications and Forensic Science in Mugar Hall, in the Forsyth Building, and at the University's Marine Science Institute at Nahant. Major research equipment includes:

- ☐ electron spin, nuclear magnetic resonance, and mass spectrometers
- ☐ liquid and gas chromatographs and an atomic absorption spectrometer
- ☐ X-ray diffractometers, an electron microscope and thermal analyzers and calorimeters
- ☐ Gouy and Faraday magnetic balances and a vibrating sample magnetometer
- ☐ vacuum ultraviolet, electron impact, photoionization, ultraviolet, visible, and infrared spectrometers
- ☐ flash photolysis, laser photolysis, and photochemical equipment
- ☐ Mössbauer spectrometer and low temperature facilities
- ☐ fluorescence emission and lifetimes and a stopped-flow apparatus
- ☐ electroanalytical, polarographic, and coulometric equipment

Interdisciplinary and Other Graduate Chemistry Programs

Some graduate students wish to pursue doctoral programs which involve substantial work in two or more departments. The chemistry department has served as the registration department for a number of students engaged in such areas. The details of establishing such a program tailored to a student's individual needs are explained on page 26 of this bulletin.

Interdisciplinary Ph.D. in Forensic Chemistry

This program is designed to prepare a student for research and leadership positions in forensic laboratories. It is offered in conjunction with the College of Criminal Justice and the Institute of Chemical Analysis, Applications and Forensic Science. Details are given on page 58.

Master of Science in Forensic Chemistry

This program is available on a full-time or part-time basis with courses being offered primarily during the evening hours. Details are given on page 59.

Master of Science in Clinical Chemistry

This is a part-time interdisciplinary program with the College of Pharmacy and Allied Health Professions. It is designed to prepare a student for employment in clinical laboratories. Details are given on page 54.

DESCRIPTION OF COURSES

All courses carry two quarter hours of credit unless otherwise specified.

12.810 Modern Methods of Analysis (3 q.h.)
Training in a wide variety of modern methods of instrumental analysis with extensive "hands-on" experience provided by a laboratory section. Areas covered include: data handling; spectroscopy (UV-visible and IR absorption, luminescence, X-ray, atomic absorption and mass spectrometry); separations (gas and modern liquid chromatography, TLC); pulse polarography; X-ray diffraction; microscopy (optical and scanning electron microscopy including X-ray fluorescence microanalysis); computerized instrumentation. (Restricted to students in the Forensic Chemistry M.S. program).

12.811, 12.812, 12.813 Special Topics in Chemistry — Chemistry and Society I, II, III
Special topics of current importance including: Chemical Aspects of the Environment: pollution and its determination, pesticides, carcinogenics, resources; Chemical Aspects of Energy Conversion and Storage: fossil fuels and fuel analysis; nuclear reactors; storage batteries; hydrogen production and storage; solar energy, photovoltaic cells and photochemistry; energy related materials. *Prep. Bachelor's degree in science or engineering.*

12.821 Analytical Separations
Theory and practice of analytical separation techniques. Emphasis will be on fundamentals as they relate to practice. Topics will be based mainly on chromatographic processes including gas and high speed liquid chromatography. Other topics will include zone refining, liquid-liquid extraction, and electrophoresis.

12.822 Electroanalytical Chemistry
The principles and practice of electroanalytical chemistry will be discussed. Topics will include potentiometry and ion-selective electrodes, normal and thin-layer coulometry, polarography, and electrochemical relaxation methods. Application of these techniques to titration endpoint detection will also be discussed.

12.823 Optical Methods of Analysis
Theory and practice of atomic absorption, fluorescence, and emission spectrometry. Use of flames, plasmas, and electrically heated rods, tubes, and furnaces as atom reservoirs. Molecular absorption and fluorescence, Raman spectrometry.

12.824, 12.825, 12.826 Special Topics in Analytical Chemistry I, II, III
Selected topics of current importance in analytical chemistry.

12.828 Chemical Instrumentation
Principles of instrument design will be considered with emphasis on practical

aspects. Instrument limitations and sources of error will be considered along with modular instruments and interfacing. *Prep. Consent of instructor.*

12.829 Computers in Chemistry (3 q.h.)
A laboratory-lecture course illustrating the use of small digital computers for real-time control of chemical instruments. Topics will include digital logic, real-time data structures, A/D and D/A conversion, noise, and other aspects of real-time computer interfacing. Programming will be done on a PDP-11 computer in MIRACL, a language designed for real-time processing. *Prep. Consent of instructor.*

12.831 Advanced Analytical Separations
Continuation of 12.821. *Prep. 12.821.*

12.833 Advanced Optical Methods of Analysis
A detailed discussion of parameters affecting analytical spectrometric measurements. Optics: pre, post, and inner filter effects; modulation and transform techniques; factors affecting signal-to-noise ratios; interferences; quenching; scattering; novel detectors; and other topics will be covered. *Prep. 12.823.*

12.841 Advanced Inorganic Chemistry I
Application of basic quantum chemistry to inorganic systems. Russell-Saunders and j-j coupling. Stereo chemistry of non-transition-metal compounds; bonding and structure of electron deficient systems.

12.842 Advanced Inorganic Chemistry II
Magnetic properties; electronic spectra and selection rules. Thermodynamic stability of coordination compounds. Experimental techniques of inorganic chemistry. *Prep. 12.841.*

12.843 Advanced Inorganic Chemistry III
Crystal symmetry. Introduction to theory of lokids; semi-conductors and metals; non-stoichiometric compounds; solid state reactions. Application of molecular orbital theory. Determination of electron distribution in transition metal compounds. Mössbauer spectroscopy and advanced magneto-chemistry. *Prep. 12.842 and 12.885.*

12.846 Coordination Chemistry
Solution phase properties of coordination compounds. Experimental methods for the study of thermodynamics stability and kinetic lability. Kinetics and mechanism of solvent exchange and substitution reactions at transition metal centers. Classification of redox reaction mechanisms. Marcus theory. Phenomenological mechanisms. *Prep. 12.843.*

12.847, 12.848, 12.849, 12.850 Special Topics in Inorganic Chemistry I, II, III, IV
Advanced topics of importance in inorganic chemistry including: Advanced Ligand Field Theory: Crystal field theory of ions in weak and strong fields. Molecular orbital theory of transition metal complexes. Crystal Structure Determination in Solids: Crystallography, X-ray, electron and neutron diffraction techniques applied to inorganic, bio-inorganic and other solids. Resonance Spectroscopy in Inorganic Chemistry: Electron spin resonance, nuclear magnetic resonance, nuclear quadrupole resonance and Mössbauer Spectroscopy. Solid State Chemistry: Thermal, magnetic and transport properties; phase transformations and crystal defects;

surface effects; material preparation techniques. *Prep. 12.842 and consent of instructor.*

12.861, 12.862 Advanced Organic Chemistry I, II
An intensive survey of organic reactions. Modern concepts of structure and mechanism are used to correlate factual material. *Prep. One year of Organic Chemistry.*

12.863 Physical Organic Chemistry
Topics in basic physical organic chemistry: molecular polarity, equilibrium and kinetics, reactivity and structure, solvent effects, acid-base catalysis, orbital symmetry, aromaticity, etc. *Prep. 12.862 or consent of instructor.*

12.864, 12.865 Organic Stereochemistry and Reaction Mechanisms I, II.
Interrelations of the stereochemistry of organic molecules with their physical and chemical behavior. Conformational analysis. The effects of spatial relationships on transition states, equilibria and reaction rates as an introduction to the study of organic reaction mechanisms. *Prep. 12.863.*

12.866 Spectrometric Identification of Organic Compounds
Interpretation of the ultraviolet, infrared and nuclear magnetic resonance spectra of organic compounds. *Prep. One year of Organic Chemistry.*

12.871, 12.872, 12.873 Special Topics in Organic Chemistry I, II, III
Selected topics of current importance in organic chemistry. *Prep. 12.862 and consent of instructor.*

12.876, 12.877 Organic Reaction Mechanisms and Organic Synthesis I, II.
The fundamental factors influencing the courses of organic reactions. Substitution reactions. Pericyclic reactions. Synthetic methods as an introduction to organic synthesis. *Prep. 12.865 or concurrent registration therein.*

12.881 Chemical Thermodynamics I
First Law of Thermodynamics, Thermochemistry, Second and Third Laws, Free Energies, Reaction and Phase Equilibria. *Prep. consent of instructor.*

12.882 Chemical Thermodynamics II
Partial Molar Properties, Solutions, Electrolytes. Statistical Analogues of Entropy and Free Energy, Partition Functions. *Prep. 12,881.*

12.883 Chemical Thermodynamics III
Statistical Thermodynamics applied to gases, liquids and solids. Irreversible Thermodynamics. *Prep. 12.882 and 12.886.*

12.885 Introductory Quantum Chemistry I
Introduction to quantum mechanics. Application to simple systems. Perturbation theory and applications. Harmonic oscillator, rigid rotor and applications to microwave and infrared spectroscopy. Simple atoms. *Prep. One year of Physical Chemistry.*

12.886 Introductory Quantum Chemistry II
The variational method. The chemical bond. H_2^+. The LCAO method. Group theory and applications. Molecules. Woodward-Hoffman rules. *Prep. 12.885.*

12.887 Introductory Quantum Chemistry III
Application of group theory and simple approximate theories to conjugated molecules. The SCF method and its application to atoms and molecules. Applications to molecular spectroscopy. *Prep. 12.886.*

12.890, 12.891, 12.892 Special Topics in Physical Chemistry I, II, III
Advanced topics of importance in physical chemistry including: Quantum Chemistry: Linear algebra and the formulation of quantum theory. Angular momentum. Group theory. Small molecules. Time-dependent theory and selected advanced topics. Statistical Mechanics: Quantum statistics; electrons in metals, photons and phonons; superconductivity; fluctuations, noise and irreversible thermodynamics; transport phenomena; phase transitions of high order. *Prep. consent of instructor.*

12.893 Chemical Kinetics
Use of experimental data to deduce the rate law of a reaction. Mechanisms deduced from rate laws. Influence of experimental error on precision of rate constants and activation energies. Collision and transition state theories of reaction rates. *Prep. One year of physical chemistry.*

12.901 Polymer Chemistry I
Introduction to polymers. Major emphasis on synthesis. Step-reaction, chain-reaction, and ring-opening polymerizations. Copolymerization. Three-dimensional polymers and crosslinking. *Prep. One year of Organic Chemistry and one year of Physical Chemistry.*

12.902 Polymer Chemistry II
Physical chemistry of polymers in solution and bulk. Molecular characterization. Mechanical and physical properties in the glassy, rubbery, viscous, and semi-crystalline states. *Prep. 12.901.*

12.903 Polymer Chemistry III
Industrial practice. Polymer processing. Fibers. Elastomers. Coatings. Adhesives. Reinforced plastics. Relationship of polymer structure to usage. *Prep. 12.902.*

12.910 Special Projects in Chemistry
Laboratory studies on a topic not directly related to research pursued for a thesis. *Prep. Permission of the departmental faculty is required.*

12.990 Seminar (1 q.h.)
Oral reports by the participants on current investigations in chemistry. *Prep. Enrollment in full-time program.*

12.991 Research and Thesis for M.S. (maximum: 14 q.h.)
Original research and a written thesis thereon, under supervision of a faculty member.

12.995 Research and Dissertation for Ph.D.
Original research in depth, representing a significant contribution of new chemical

knowledge, and a written dissertation thereon, under the supervision of a faculty member.

90.821 Biochemistry I
Discussion of the structures and chemistries of carbohydrates, proteins, lipids, nucleic acids, and selected cofactors. *Prep. One year organic chemistry.*

90.822 Biochemistry II
Bioenergetics, enzymes and enzyme kinetics, intermediary metabolism including carbohydrate catabolism, tricarboxylic acid cycle, electron transport, and oxidative phosphorylation. *Prep.Biochemistry I, 90.821.*

90.823 Biochemistry III
Continuation of intermediary metabolism from Biochemistry II, including lipid, protein, and nucleic acid metabolism, photosynthesis and cell regulation. *Prep. Biochemistry II, 90.822.*

See Biology Department offerings and College of Pharmacy offerings for other courses on chemical topics.

clinical chemistry

MASTER OF SCIENCE IN CLINICAL CHEMISTRY

Part-Time Program

Admission

In addition to the admissions requirement listed on page 22, the applicant must have completed a baccalaureate program in biology, chemistry, medical technology, or pharmacy. Undergraduate requirements in this program are a minimum of two quarters of organic chemistry, two quarters of analytical chemistry (each with a laboratory or its equivalent), two quarters of human physiology, and two quarters of physical chemistry. An individual who has deficiencies in any of these areas may take appropriate evening courses at Northeastern University concurrently with those graduate courses which do not require the deficient prerequisites. The appropriate evening courses offered at University College of Northeastern University are: Analytical Chemistry 12.521-6, Organic Chemistry 12.531-3, Physical Chemistry 12.541-3, Human Anatomy and Physiology 18.524-6. Equivalent courses from this university or other universities will be accepted.

Program

The Master of Science in Clinical Chemistry is an interdisciplinary program with the College of Pharmacy and Allied Health Professions. Forty quarter hours of academic coursework are required. In addition, a student must have at least one year of acceptable clinical laboratory experience prior to completion of academic degree requirements. Students in good standing in the program who lack this experience requirement may apply for an applied study (training) course in clinical chemistry. This course is offered through the College of Pharmacy and Allied Health Professions of Northeastern University at one of nearby affiliated hospitals, and provides three months of this experience requirement. Individuals who have completed this course achieve an enhanced opportunity to obtain subsequent employment in this field and thereby satisfy the one year of experience requirement.

The program is available on a part-time basis with courses offered primarily during the evening hours. Courses are scheduled in the Fall, Winter, Spring, and Summer Quarters. The following are core courses required in the program:

		Total Credits
12.821	Analytical Separations	2
12.823	Optical Methods of Analysis	2
72.834	Clinical Chemistry I	2
72.835	Clinical Chemistry II	2
72.837	Seminar and Report in Clinical Chemistry*	2
73.845	Radioisotopes in Biological Systems	2
87.807	Biometrics	2
87.810	Functions of Human Systems	2
90.821	Biochemistry I	2
90.822	Biochemistry II	2
90.823	Biochemistry III	2
		22

*The first quarter of 72.837 is a required course. However, the course may be repeated twice as an elective.

Twelve additional credits must be taken from the following elective core courses:

		Credits
12.822	Electroanalytical Chemistry	2
12.824	Special Topics in Analytical Chemistry I	2
12.825	Special Topics in Analytical Chemistry II	2
12.828	Chemical Instrumentation	2
12.829	Computers in Chemistry	3
72.836	Protein Analysis	2
72.837	Seminar and Report in Clinical Chemistry	2
72.861	Central Nervous System Depressants	2
72.862	Autonomic Drugs	2
72.863	Anti-infectives	2

72.864	Cancer Therapy	2
72.865	Special Topics in Medicinal Chemistry	2
73.816	Concepts in Toxicology I	2
73.817	Concepts in Toxicology II	2
73.844	Drug Metabolism	2
87.811	Pathophysiology I	2
87.812	Pathophysiology II	2

Taken with the approval of the Admissions Committee and the course instructor, selection may be made from the above courses as well as the following and other appropriate graduate courses in the University.

		Credits
12.841	Advanced Inorganic Chemistry I	2
12.842	Advanced Inorganic Chemistry II	2
12.846	Coordination Chemistry	2
12.861	Advanced Organic Chemistry I	2
12.862	Advanced Organic Chemistry II	2
12.863	Physical Organic Chemistry	2
12.866	Spectrometric Identification of Compounds	2
12.881	Chemical Thermodynamics I	2
12.885	Introductory Quantum Chemistry I	2
12.893	Chemical Kinetics	2
18.245	Immunology	3
18.840	Comparative Physiology of Regulatory Mechanisms	2
18.842	Vertebrate Endocrinology	2
18.843	Procedures in Endocrinology	3
18.860	Cell Biophysics and Biochemistry	5
18.909	Animal Virology	4
18.940	Microbial Biochemistry	4
72.837	Seminar and Report in Clinical Chemistry	2
73.814	Concepts in Pharmacology I	2
73.815	Concepts in Pharmacology II	2
73.818	Special Topics in Pharmacology	2
73.819	Pharmacological Instrumentation	2
72.866	Phytochemistry	2
87.802	Advanced MLS Hematology and Immunology	2

DESCRIPTION OF COURSES

All courses carry two quarter hours of credit unless otherwise indicated.

Courses with the prefix number 12 are chemistry offerings. Their descriptions may be found in the preceding section of this bulletin along with interdisciplinary biochemistry courses (prefix number 90).

72.834 Clinical Chemistry I
Principles, instrumentation, methodology, and interpretations in clinical chemistry. *Prep. 90.823.*

72.835 Clinical Chemistry II
A Continuation of Clinical Chemistry I. *Prep. 72.834.*

72.836 Protein Analysis
Laboratory and discussion of electrophoretic and immunochemical methods of analysis of proteins of clinical or forensic interest. *Prep. 72.835.*

72.837 Seminar and Report in Clinical Chemistry
Reports and discussions of current journal articles in clinical chemistry. *Prep. 72.835.*

72.861 Central Nervous System Depressants
Presentation and discussion of the chemistry, structure-activity relationships, and mechanism of action of general anesthetics, hypnotics and sedatives, anti-epileptics, analgetics, tranquilizers, and muscle relaxants. A consideration of the mechanics of drug design and methods of modification will be undertaken. *Prep. Two quarters of Organic Chemistry. Offered alternate years.*

72.862 Autonomic Drugs
A discussion of drugs acting on the central nervous system with a special emphasis on the mechanism of action of the chemical mediators of the peripheral nervous system. The role of agents affecting this system—adrenergic and cholinergic and reversible and irreversible inhibitors of these systems will be discussed in relation to their chemical structure and biological activity. *Prep. Two semesters of Organic Chemistry. Offered alternate years.*

72.863 Anti-Infectives
A study of the various chemotherapeutic agents employed in the treatment of infectious diseases. Included will be the sulfonamides, antibiotics, antivirals, antitubercular, antifungal, and antimalarial agents. Special emphasis will be on structure-activity relationships, mechanisms of action, and modern research in each area. *Prep. Two quarters of Organic Chemistry. Offered alternate years.*

72.864 Cancer Therapy
Recent developments in new approaches to the treatment of cancer from a chemotherapeutic standpoint will be considered: including alkylating agents, antimetabolites, hormones, and miscellaneous compounds, and combinations of the above with radiation and immunology. Possible mechanisms of action will be explored. *Prep. Two quarters of Organic Chemistry. Offered alternate years.*

72.865 Special Topics in Medicinal Chemistry
A consideration of a special area of medicinal chemistry including either CNS compounds, pharmacodynamic agents or chemotherapeutics; their chemistry and structure-activity relationships will be presented. *Prep. Two quarters of Organic Chemistry. Offered alternate years.*

72.866 Phytochemistry
The important classes of chemical compounds produced by plants considered from the standpoint of their biogenetic origin, methods for their detection, isolation and characterization; application of these techniques to research in pharmacy, medicine, economic botany, taxonomy; and introduction to the literature of plant chemistry. *Prep. Two quarters of Organic Chemistry, two quarters of Biology. Offered alternate years.*

73.816 Concepts in Toxicology I
Concepts of modern toxicology in which emphasis is placed on biochemical mechanism underlying the toxicological action of drugs and other chemical substances upon biological systems. Selected topics in toxicology including acute, subacute, and chronic effects of drugs in the experimental animal and man. Consideration of the predictive value of animal studies for drug effects in man. *Prep. Permission of Instructor. Offered alternate years.*

73.817 Concepts in Toxicology II
Continuation of Concepts in Toxicology I. *Prep. 73.816. Offered alternate years.*

73.844 Drug Metabolism
Presentation of detoxication mechanisms relating to drug metabolism and excretion patterns: adaptive factors influencing metabolism will be discussed. *Prep. Biochemistry I, 90.821.*

73.845 Radioisotopes in Biological Systems
Methodology of radioactive nuclides and application of these isotopes to biology and medicine with special emphasis on their use in clinical analysis.

Other biology, chemistry, and pharmacy courses may be taken with the approval of the admissions committee and the course instructor.

forensic chemistry

INTERDISCIPLINARY PH.D. PROGRAM IN FORENSIC CHEMISTRY

This program is being offered in conjunction with the College of Criminal Justice and Northeastern University's Institute of Chemical Analysis, Applications and Forensic Science. This unique program is designed as a preparation for research and leadership positions in forensic laboratories. The Chemistry Department is the registering department for two of the three specializations of this program, namely, forensic analytical chemistry and forensic materials science; a third specialization, forensic toxicology, is administered by the College of Pharmacy, again in connection with the College of Criminal Justice. Admission is made through the registering department.

For students entering with a B.S., completion of the M.S. course requirements in Forensic Chemistry (described below, page 59) with a B average is required to qualify for further Ph.D. study. For students with M.S. degrees in forensic science or the natural sciences, individual programs are planned according to the student's background. The course of study includes comprehensive examinations, thesis research to be carried out at the Institute of Chemical Analysis, Applications and Forensic Science and an internship at a major forensic laboratory engaged in research.

MASTER OF SCIENCE IN FORENSIC CHEMISTRY
Full-Time and Part-Time Program

Admission

In addition to the admissions requirements listed on page 22, the applicant must have completed a baccalaureate degree in the physical or life sciences. Undergraduate courses must include general chemistry, organic chemistry, analytical chemistry, physics, and calculus. An individual who has deficiencies in any of these areas may take the appropriate courses at Northeastern University concurrently with those graduate courses which do not require the deficient prerequisites. Although they are not prerequisites for the program, courses in general biology, botany, microbiology and computer science are desirable.

Program

The Master of Science in Forensic Chemistry is an interdisciplinary program involving cooperation among the College of Liberal Arts, the College of Criminal Justice, and the Institute of Chemical Analysis, Applications and Forensic Science. Forty-two quarter hours of academic graduate coursework are required, including a Master's paper. In addition, a three-months internship consisting of full-time work in an approved, practicing forensic laboratory is required. The full-time program will thus generally encompass five quarters; this may be reduced to four quarters if the student can demonstrate to the satisfaction of the program committee the prior completion of three months or more of equivalent forensic laboratory experience. The program is available on a full-time or part-time basis; courses are offered primarily during the evening hours. Graduate courses are scheduled in the Fall, Winter, and Spring Quarters. The following are core courses required in the program.

Required Courses		Credits
12.810	Modern Methods of Analysis	3
73.816	Concepts in Toxicology I	2
87.807	Biometrics	2
90.821	Biochemistry I	2
92.824	Legal Aspects of Forensic Science	3
92.904	Administration of Criminal Justice	3
92.921	Arson and Explosives	3
92.931	Crime Scene Investigation	3
93.950	Forensic Materials	2
93.951	Forensic Chemistry Techniques I	4
93.952	Forensic Chemistry Techniques II	4
93.953	Seminar	1
93.954	Master of Science Paper	4

Six additional credits must be taken from the following list of elective courses.

2.970	Material Science and Engineering	2
2.971	Material Science and Engineering	2
12.821	Analytical Separations	2
12.822	Electroanalytical Chemistry	2
12.823	Optical Methods of Analysis	2
12.824	Special Topics of Analytical Chemistry I	2
12.825	Special Topics of Analytical Chemistry II	2
12.826	Special Topics of Analytical Chemistry III	2
12.861	Advanced Organic Chemistry I	2
12.862	Advanced Organic Chemistry II	2
12.863	Physical Organic Chemistry	2
12.866	Spectrometric Identification of Organic Compounds	2
12.901	Polymer Chemistry I	2
12.902	Polymer Chemistry II	2
12.903	Polymer Chemistry III	2
72.834	Clinical Chemistry I	2
72.835	Clinical Chemistry II	2
72.861	C N S Depressants	2
72.862	Autonomic Drugs	2
73.814	Concepts in Pharmacology I	2
73.815	Concepts in Pharmacology II	2
73.817	Concepts in Toxicology II	2
73.844	Drug Metabolism	2
90.822	Biochemistry II	2
90.823	Biochemistry III	2
92.913	Criminal Justice Planning and Development	3
92.841	Criminal Law	3

economics

Professors
Morris A. Horowitz, Ph.D., Chairman
Harold M. Goldstein, Ph.D.
Irwin L. Herrnstadt, Ph.D.
Peggy Musgrave, Ph.D.
Gustav Schachter, Ph.D.
Donald Shelby, Ph.D.

Associate Professors
Conrad P. Caligaris, Ph.D.
Ernest M.DeCicco, Ph.D.
Daryl A. Hellman, Ph.D.
Sungwoo Kim, Ph.D.
Pawan K. Sawhney, Ph.D.

Assistant Professors
Yudhishter L. Mahajan, Ph.D.
Joel Naroff, Ph.D.
Andrew Sum, M.A.

The Economics Department offers four terminal programs with different admission requirements and program form and content in an effort to serve students with varying backgrounds, interests, and goals. These programs are: a non-degree certificate program, an M.S. degree program in economic policy and planning, an M.A. degree program with specialization in one of four available fields, and a doctoral degree program.

CERTIFICATE PROGRAM

The Economics Department offers a non-degree program in the Economics of Manpower and Development Planning. Upon completion of the prescribed program, students will receive a certificate issued by the Graduate School of Arts and Sciences, Northeastern University. The program is designed for students interested in a specialized program of courses in manpower and development planning but who do not wish to meet the requirements of a degree program.

Admission

Admission to the program will be considered for graduates of recognized universities or institutes of technology, although practical experience in manpower planning or development planning may be substituted for the

admission requirements at the discretion of the faculty. All foreign students must submit a TOEFL test score or an equivalent certification of the applicant's proficiency in English along with the application and academic transcripts.

Program

This certificate program is designed to be completed in one year. Students admitted to the program may not transfer into the regular degree programs. Evidence of completion of a course and of the program shall be attendance, all required reading, and all written work. Successful completion of a course shall be noted by a pass designation.

Fall Quarter (All four courses required)
- 39.9B0 Introductory Macroeconomic Theory
- 39.9A0 Introductory Microeconomic Theory
- 39.9G1 Economics of the Labor Market
- 39.9P1 Economic Development

Winter Quarter (Select any two of three electives listed)
- 39.250 Statistics (Required)
- 39.9G4 Manpower Planning I (Elective)
- 39.9P4 Regional Development (Elective)
- 39.9Q1 Development Finance (Elective)

Spring Quarter (Select any three of four courses listed)
- 39.9J1 Seminar in Human Resource Development
- 39.9R1 Seminar in Development Planning
- 39.9G5 Manpower Planning II
- 39.9P6 Comparative Economic Development

Variations in this basic program are possible only with prior approval of the Graduate Director.

THE MASTER OF SCIENCE DEGREE IN ECONOMIC POLICY AND PLANNING

Forty-one quarter hours of academic work are required. The program consists of 20 quarter hours of required courses and 21 quarter hours of electives. With the approval of the program advisor, a student may select a maximum of 9 quarter hours from graduate courses offered by other departments. This is a terminal degree program designed mainly for working economists, government agency officials, and middle echelon employees in the private sector.

Admission

Applicants must meet the general admission regulations of the Graduate School of Arts and Sciences.

Comprehensive Examination

After completion of courses, a comprehensive examination is required of all students to test their ability to apply concepts and tools in the broad field of economic policy and planning. The examination may be repeated only once.

Master's Thesis

A Master's thesis for a maximum of six quarter hours of credit is optional, with the approval of the program advisor.

Course Requirements

A. Required Core Courses		Q.H. Credits
39.9A0	Introductory Microeconomic Theory	4
39.9B0	Introductory Macroeconomic Theory	4
39.9F0	Introduction to Statistics/Mathematics	4
39.9F1	Economic Policy and Planning I	4
39.9F2	Economic Policy and Planning II	4

B. Elective Courses

A total of twenty-one hours of electives (12 of which must be economics courses) may be selected by the student in accordance with interests and needs. Electives may be concentrated in any of the available areas or may be distributed among fields to obtain a broader exposure. All economics electives are 3 quarter hour credits. A maximum of 6 credits for courses taken at other institutions may be accepted if taken during the past 7 years.

THE MASTER OF ARTS DEGREE

Forty quarter hours of academic work are required. This program comprises 16 quarter hours of required core course work and 24 quarter hours of electives of which a minimum of twelve quarter hours must be selected from one of the economic fields listed below. The required core courses must be completed as soon as possible. With the approval of the graduate adviser, a student may select a maximum of six quarter hours from graduate courses offered by other departments, or two advanced undergraduate courses in economics carrying three quarter hours of graduate credit.

Admission

In addition to the general admission requirements of the Graduate School of Arts and Sciences, applicants should have had a minimum of 12 semester hours of economics, or the equivalent, of which three semester hours, or the equivalent, should be statistics. Admission is only possible in the Fall and Winter Quarters. Application for admission to the Fall Quarter

will be given consideration if received by August 31. Applications for admission to the Winter Quarter will be given consideration if received by November 30.

Applications for financial aid should be submitted no later than March 15. See page 31 for information on financial aid available.

Comprehensive Examination

A comprehensive examination, which will be held in accordance with the general graduate school regulations, must be taken by all students during the quarter in which the student completes the 40 quarter hours of academic work. The examination may be repeated only once.

Master's Thesis

A master's thesis for six quarter hours of credit is optional with the approval of the graduate adviser. Approval will be granted only in those instances in which previous graduate work of the student indicates capacity for independent study.

Required Core Courses*

The required core courses are:

		Credits
39.9A1	Microeconomic Theory**	4
39.9B1	Macroeconomic Theory**	4
39.9E1	Statistical Inference	4
39.9E7	Econometrics I	4

Economic Fields

Available economic fields are listed below. Under each field are stated the required field courses and the elective field courses. Students must take at least twelve quarter hours in one field of concentration. In all fields the first listed required course in the field ordinarily should be taken first by the student majoring in the field. For students not majoring in the field, courses in the field may be taken in any sequence.

Manpower Economics

Required field courses:

39.9G1 Economics of the Labor Market and Labor Force
39.9G4 Economics of Manpower Planning I
39.9J1 Seminar in Human Resource Development

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* Students must demonstrate competence in mathematics by taking a mathematics examination given by the department during registration week prior to the start of the Fall Term. Students must pass this exam or register for 39.9D0.

**Candidates deficient in intermediate theory may not be admitted into these core courses until they have completed 39.9A0 and/or 39.9B0.

Elective field courses:
- 39.9G5 Economics of Manpower Planning II
- 39.9G7 Human Resources and Labor Problems and Policies
- 39.9H1 Economics of Medical Care and Health Manpower
- 39.9H3 Economics of Education

Urban/Regional Economics

Required field courses:
- 39.9K1 Regional Economics
- 39.9L1 Urban Economics I
- 39.9N1 Seminar in Urban/Regional Economics

Elective field courses:
- 39.9K5 Economics of Crime
- 39.9L2 Urban Economics II
- 39.9L5 Economics of Urban Transportation
- 39.9L7 Economics of Inter-City Transportation
- 39.9M1 Intergovernmental Fiscal Relations

Development Economics

Required field courses:
- 39.9P1 Economic Development
- 39.9P3 Regional Development
- 39.9R1 Seminar in Development Planning

Elective field courses:
- 39.9P6 Comparative Economic Development
- 39.9Q1 Development Finance
- 39.9G4 Economics of Manpower Planning I
- 39.9K1 Regional Economics

Economics of Money and Finance

Required field courses:
- 39.9S1 Monetary Theory
- 39.9S3 Monetary Policy
- 39.9V1 Seminar in Money and Finance

Elective field courses:
- 39.9T1 Public Policy and Finance
- 39.9T5 Capital Markets
- 39.9Q1 Development Finance
- 39.9M1 Intergovernmental Fiscal Relations

THE DOCTOR OF PHILOSOPHY DEGREE

The doctoral degree program in economics is offered in the fields of manpower, urban-regional, development, and monetary economics.

Admission

Applicants who will have a master's degree in economics or its equivalent at entry may be considered for direct admission to the doctoral program. Applicants who will not have a master's degree in economics or its equivalent at entry may apply for admission to the doctoral program after the satisfactory completion of 40 quarter hours of graduate work.

Admission to the doctoral program is possible only in the Fall Quarter. Applications for the doctoral program must be submitted no later than March 15.

Residence Requirement

After acceptance to the doctoral program, the student may satisfy the residence requirement by one year of full-time graduate course work. Teaching assistants may satisfy the residence requirement by two consecutive years of half-time graduate course work. A student should expect to spend at least two academic years in full-time study, or its equivalent, completing the requirements for the doctoral degree.

Degree Candidacy

Degree candidacy is established in accordance with the general graduate school regulations.

Course Requirements

A. At least 32 quarter hours of graduate work beyond the master's degree are required. These include:

Required Core Courses:

39.9A2	Microeconomics II
39.9B2	Macroeconomics II
39.9D1	Mathematics for Economists
39.9E8	Econometrics II

B. Concentration in one academic field. Course work in the field must include the doctoral seminar sequence 39.9C1 and 39.9C2. This seminar has a prerequisite of 12 quarter hours of graduate course work in the field.

Qualifying Exam

Each student must pass comprehensive qualifying examinations after the completion of the required core and field courses. These exams are: (1) a two-hour written exam in macroeconomic theory; (2) a two-hour written exam in microeconomic theory; (3) a two-hour written exam in quantitative methodology; (4) a three-hour written exam in one doctoral field; and (5) a two-hour general oral exam. Passing the qualifying exams signifies that the student has completed all course requirements and can now devote all the time to dissertation. An examination may be repeated only once.

Doctoral Dissertation

An original doctoral dissertation is required of all students in accordance with the general graduate school regulations and the regulations established by the department. After the successful completion of the qualifying examination, each student shall work with a dissertation adviser under whose guidance he will write the doctoral dissertation. The dissertation adviser serves as chairman of the dissertation committee which must approve the dissertation before the degree may be conferred.

Final Oral Examination

The final oral examination will be established in accordance with the general graduate school regulations.

DESCRIPTION OF COURSES

All courses carry three quarter hours of credit unless otherwise specified.

Courses indicating microeconomic theory as a prerequisite refer to 39.9A0 for M.S. degree students and 39.9A1 for M.A. degree students.

Courses indicating macroeconomic theory as a prerequisite refer to 39.9B0 for M.S. degree students and 39.9B1 for M.A. degree students.

39.9A0 Introduction to Intermediate Microeconomic Theory
Intensive coverage of basic micro theory. This course carries academic credit for the M.S. degree program but no credit toward the M.A. or Ph.D. programs.

39.9A1 Microeconomic Theory I (4 q.h.)
A non-math treatment of microeconomic theory at the beginning graduate level. An investigation of the conditions underlying consumer and producer equilibrium under different objective functions and various market structures. Derivation of product demand curves, supply curves, and factor demand curves for alternative market structures in product and factor markets are surveyed.

39.9A2 Microeconomic Theory II (4 q.h.)
An examination of contemporary microeconomic problems and theory with specific emphasis on welfare economics, general equilibrium, distribution, the theory of the firm, and the ability of modern value theory to reach meaningful and feasible policy conclusions. *Prep. 39.9A1 and consent of instructor.*

39.9B0 Introduction to Intermediate Macroeconomic Theory
Intensive coverage of basic macro theory. This course carries academic credit for the M.S. degree program but no credit toward the M.A. or Ph.D. programs.

39.9B1 Macroeconomic Theory I (4 q.h.)
Income and employment theory; classical, Keynesian, and post-Keynesian aggregate demand and supply systems.

39.9B2 Macroeconomic Theory II (4 q.h.)
Theory and problems of macro-dynamics, growth, inflation, cycles, and stabilization policy. *Prep. 39.9B1 and consent of instructor.*

39.9C1 Doctoral Research Seminar I (4 q.h.)
Prep. 12 q.h. of field work and consent of instructor.

39.9C2 Doctoral Research Seminar II (4 q.h.)
Prep. 39.9C1.

39.9D0 Introduction to Mathematics for Economists (4 q.h.)
This course acquaints the student with the algebra and elementary calculus necessary for quantitative economics: simultaneous linear systems; polynomial, logarithmic, and exponential functions; and elementary differential and integral calculus. *This course offers no credit toward a degree in economics.*

39.9D1 Mathematics for Economics (4 q.h.)
Application of matrix algebra and simple multivariate calculus to economic analysis. Static organization and dynamic analysis, difference and differential equations. Examples from economic theory. *Prep. 39.9D0 or mathematics examination.*

39.9E1 Statistical Inference (4 q.h.)
A study of statistical methods and techniques used in economic analysis. Descriptive statistics, index number and time series problems, sampling problems, testing economic hypotheses, estimation techniques, correlation and regression analysis, analysis of variance.

39.9E5 Economic Programming
Economic programming with emphasis on linear programming, including the transportation and simple problems, and simulation and queuing theory with applications to the computer. *Prep. 39.9D1.*

39.9E7 Econometrics I (4 q.h.)
Review of matrix algebra; single equation least squares estimates and their theoretical properties; hypothesis testing and measures of goodnesss of fit; definitions of and tests for autocorrelation, heteroskedasticity, and multicollinearity; simultaneous equations estimation: identification, bias, and alternative estimation techniques. *Prep. 39.9E1.*

39.9E8 Econometrics II
Assymptotic and small sample properties of various estimators; rank-order conditions for identification; specification error and error in variables; remedies for autocorrelation and multicollinearity; dummy variables; distributed lags; forecasting and simulation; non-linear estimation; alternative estimation technique (two-stage least squares, three-stage least squares, maximum likelihood estimators, etc.). *Prep. 39.9E7.*

5.913 Data Processing
A study of digital computers and computer programming techniques. The FORTRAN language is utilized for programming and running several projects.

39.9F0 Introduction to Statistics/Mathematics (4 q.h.)
Data sources, time series analysis, descriptive statistics, hypothesis testing and regression and correlation analysis. Forms and graphical presentation of functions, input-output analysis, the concept of derivatives and potential use in mathematical

analysis. This course carries academic credit for the M.S. degree program but no credit toward the M.A. or Ph.D. program.

39.9F1 Seminar in Economic Policy and Planning I (4 q.h.)
Students are required to participate in a project in their own field of interest, covering such issues as metropolitan and regional job creation policies, budget analysis, evaluation of public programs and the role of private and public sectors in regional development. Techniques for planning such as construction and use of data banks, application of input-output analysis, industrial location analysis and social benefit-cost analysis are covered. The role of agencies in the organization and implementation of programs and plans are examined. *Prep. 39.9A0, 39.9B0, 39.9F0 co-requisite.*

39.9F2 Seminar in Economic Policy and Planning II (4 q.h.)
Prep. 39.9F1.

39.9G1 Economics of the Labor Market and Labor Force
Labor force measurement and determinants, changing labor market role of women; micro-analysis of labor supply and demand, varieties of labor markets and their functioning; minimum wages; wage structures and differentials, labor allocation and migration; union impact on wage levels and structures; macro-wage-employment determination, macro-wage-price problems, income policies. Applications to developing and developed economies.

39.9G4 Economics of Manpower Planning I
The role of manpower planning and its integration with general development planning. Analysis and evaluation of different techniques of manpower planning. Technological versus economic methods. Practice of manpower forecasting and data problems. Skill training versus educational strategies. Models of educational planning and their applications to different countries. *Prep. Microeconomic Theory.*

39.9G5 Economics of Manpower Planning II
Applications of manpower planning methods and techniques to problems of national economic development. Cost-benefit and cost-effectiveness of educational and manpower programs. Special problems of health manpower, scientists, engineers, and technicians. Evaluation of methods and prediction used in national manpower plans. *Prep. 39.9G4.*

39.9G7 Human Resources and Labor Problems and Policies
Unemployment and underemployment, technological change and changing skill requirements; income distribution and poverty; human capital theories and human resource development; employment and training policies to raise personal earnings, income maintenance programs. Topics discussed in relation to developing and developed economies.

39.9H1 Economics of Medical Care and Health Manpower
The organization of medical care, the problems associated with various alternative delivery systems, the utilization and availability of physicians and other categories of paramedical personnel, the growth and pressures exerted by third party payers; and consideration of federal, state, and municipal participation in the delivery of quality medical care under various alternatives for national health insurance.

39.9H3 Economics of Education
An examination of the contribution of education to the process of economic growth and the way education is produced and distributed. Special topics to include: inequalities in returns to education; the role of intelligence and class background in educational success; and socializing role of education in production.

39.9J1 Seminar in Human Resource Development
Selected topics on the development and use of human resources. *Prep. Consent of instructor.*

39.9K1 Regional Economics
Delineating regions. Theories of location for firms, industries, and people. Regional income accounting systems, and models of intra- and inter-regional income determinants and impact analysis. *Prep. Microeconomic Theory.*

39.9K4 Externalities
Theoretical foundations for urban and regional economics. Survey of economic theory related to externalities and welfare economics. *Prep. 39.9A1 and consent of instructor.*

39.9K5 Economics of Crime
A discussion of the resource allocation problem as it relates to criminal behavior and effective law enforcement. Evaluation of costs and benefits of alternative law enforcement policies. Criminal activity, including organized crime, will be analyzed in an economic context.

39.9L1 Urban Economics I
The economy of cities. Analysis of intra-metropolitan spatial relationships including residential location, land and housing markets. *Prep. Microeconomic Theory.*

39.9L2 Urban Economics II
Continuation of Urban Economics I. Problems in urban economics including segregation, housing, transportation, urban renewal, and related policy issues. *Prep. 39.9L1.*

39.9L5 Economics of Urban Transportation
Urban agglomeration, economic activities, residential concentration and transportation network; urban and suburban densities in relation to the central place; capital budgeting; pricing; costs incidence and externalities of various modes; cost-benefit analysis; effects of transportation patterns on urban socio-economic life; modal split and forecasting economic requirements for integrated urban transport needs.

39.9L7 Economics of Inter-City Transportation
Investigates the rationale for intercity freight and passenger movements within the framework of interregional commodity flows. The choice of mode once traffic volume has been determined. The economic and environmental impacts of the choice of mode are studied.

39.9M1 Intergovernmental Fiscal Relations
A study of the development of the federal system, interstate and interarea fiscal comparisons, grants-in-aid, tax credits, revenue sharing, state and local taxes, non-tax

revenues, borrowing and budgeting at the state and local level, and a discussion of the process and prospects of state and municipal equalization of tax burden and effort. *Prep. Microeconomic Theory.*

39.9N1 Seminar in Urban/Regional Economics
Selected topics in urban/regional economics. *Prep. Consent of instructor.*

39.9P1 Economic Development
A study of the prospects of economic growth in less developed areas. Measurement and theories of economic development. Role of human and natural resources, education, technology, and capital formation in national, regional, and sectoral development. Changes in institutions.

39.9P3 Regional Development.
Intra-regional dynamics, dualism, and spontaneous polarization. Growth poles, dispersion, and spread effect; inter-regional factor migration and social cost; regional structural change and dynamic analysis; public policies and planning; socio-economic variables and measurements; feasibility and simulation in shortrun analysis. Examples of regions at county, province, state and "area" level; differentiation between political and economic boundaries; bootstrapping vs. outside source approach. Application of the FS and UN multiregional models.

39.9P6 Comparative Economic Development
Comparison of economic systems in differing stages of economic development as exemplified by Yugoslavia, Southern Italy, Turkey, the Middle East, and China.

39.9Q1 Development Finance
Sources of investment finance in developing countries; role of taxation and tax structure reform; development of financial institutions and capital markets; private and official finance from abroad and debt-service problems; problems of monetary management and export instability.

39.9R1 Seminar in Development Planning
Planning techniques at the national, regional project and plan level. Planning for system of regions; interindustry economic programming; interdependence, resource use, and structural change. Application of input-output and linear and non-linear optimal decision techniques to short-run planning and long-run projection. Evaluation of discontinuities, linkages, and "openness." Planning in closed and open economy. The role of the private sector and the governments, limits, sequence, and optimality in planning. Application of techniques to empirical examples. *Prep. Consent of instructor.*

39.9S1 Monetary Theory
A study of the relationships between money and economic activity with emphasis upon various quantity theory models and theories of the demand for money and velocity. *Prep. Macroeconomic Theory.*

39.9S3 Monetary Policy
A study of the interrelationships between aggregate economic activity, financial markets and central banking instruments, objectives and policy.

39.9T1 Public Policy and Finance
Techniques of fiscal policy, fiscal policy norms, public sector debt; tax policy; federal tax reform; the conflict between social implications of price stabilization and full employment; public expenditure policy and the interrelationship between monetary and fiscal controls. *Prep. Macroeconomic Theory.*

39.9T5 Capital Markets
Primary sources of savings and demand for financial assets; role of financial intermediaries; banking system and government lending agencies. Demand for funds and real investment — mortgage, corporate and government securities markets; interdependence of rate structures. Flow of funds data in relation to national income accounts.

39.9V1 Seminar in Money, Credit, and Banking.
Selected topics in the economics of money, credit and banking. *Prep. Consent of instructor.*

39.9Z1 Master's Thesis Seminar (maximum 6 q.h.)
Thesis supervision by members of the department; approval of graduate adviser required.

39.9Z2 Readings in Economics (up to 3 q.h.)
Supervised reading in selected topics in economics. *Prep. Consent of instructor and approval of graduate adviser.*

39.9Z5 Doctoral Dissertation Seminar (no credit)
Prep. Approval of graduate adviser required.

english

Gordon E. Pruett, Ph.D., Acting Chairman

Professors
Raymond E. Blois, Ph.D.
Victor E. Howes, Ph.D.
Samuel French Morse, Ph.D.
Stanley J. Trachtenberg, Ph.D.
Arthur J. Weitzman, Ph.D.
Paul C. Wermuth, Ph.D.

Associate Professors
Gerald R. Griffin
Acting Director of
Graduate Studies
Samuel J. Bernstein, Ph.D.
Robert J. Blanch, Ph.D.
Frank C. Blessington, Ph.D.
M. X. Lesser, Ph.D.
James Nagel, Ph.D.
Jane A. Nelson, Ph.D.
Robert B. Parker, Ph.D.
Kinley E. Roby, Ph.D.
Herbert L. Sussman, Ph.D.

Assistant Professors
Irene R. Fairley, Ph.D.
Norma Kroll, Ph.D.
Joseph E. Westlund, Ph.D.

THE MASTER'S DEGREE

The Department of English offers a program leading to the M.A. degree. The courses emphasize training in research and criticism in the fields of English and American literature, and they provide the student the comprehensive background necessary for a career as a scholar, teacher, and writer.

Admission

Applicants are judged favorably if they do superior work in their undergraduate preparation and do significantly better than average in the verbal and advanced sections of the Graduate Record Examination, the scores of which are required before an application will be considered. An applicant is expected to have had at least 24 semester credits in English courses on a 4 point scale. Recommendations should be submitted by former English professors. An applicant who is deficient in any one of these areas may be admitted as a provisional student.

The category of special student is provided for those nondegree students who wish to take a summer course or those already enrolled in a graduate program in another institution who wish to transfer credit. A holder of a graduate degree in English may also enroll as a special student.

Program

Forty-two quarter hours of academic work are required. The course work must include 30.8A1, Bibliography and Literary Historiography, which should be taken as soon as the student enters the program. Required also are three hours from courses in Group II; three hours from courses in Group III; and three hours from courses in Group IV; three hours from courses in Group V (or their equivalents among the seminars); and fifteen hours in designated seminars, which are limited in enrollment to twelve students. The remaining twelve hours may be elected from any courses in the program.

Transfer Credit

A student may transfer from another institution no more than 12 quarter hours (9 semester hours) of graduate credit in English. Within this limit, graduate courses in other fields may also be transferred if their relevance to the student's specialized interest can be demonstrated. In every case, a petition for graduate credit must be sent to the Director of the Graduate School of Arts and Sciences with a copy of an official transcript.

Thesis

A thesis is optional. A student wishing to write a master's paper must secure the approval of a graduate faculty member and write the thesis under the supervision of his adviser. Six credits in lieu of course work are allowed. The student must enroll in 30.9Z1, Thesis, to obtain credit. Papers must conform to the guidelines laid down in the *MLA Style Sheet.*

Comprehensive Examination

A four-hour comprehensive examination is required. It will be given during the Fall and Spring Quarters. Copies of previous examinations are available in the graduate director's office. A student must accrue 30 quarter hours of credit before he is eligible to take the examination. The examination may be taken only twice. As an option, students may choose an oral examination in lieu of the written comprehensive. This must be arranged with the graduate director.

Language Requirement

Normally a degree candidate must pass a reading examination in French or German or Latin. Substitutions must have the approval of the graduate director. Exemption from the examination may be obtained by submitting evidence of having passed with at least a grade of C an *advanced* undergraduate language course carrying six semester credits or eight quarter credits. The examinations will be offered during the Fall and Spring quarters.

PROGRAM OF ADVANCED LITERARY STUDY

The Department of English offers a program of advanced work in humanistic literary study for those people who already hold the Master's degree. Neither an intermediate step toward a research-oriented Ph.D. nor instruction in pedagogy, the program is designed as "state of the art" training in literary studies. The program is directed toward practitioners in the field as well as those for whom continuing literary study is an end in itself. The program is designed for both full-time and part-time study. Financial aid is available.

Admission

Applicants must have a Master's degree and are expected to submit transcripts of undergraduate and graduate work.

Program

Each student will follow an individualized coherent course of study built around his or her own needs and designed in close association with a faculty advisor. The student will develop the outline of this program by the end of the first quarter of work at Northeastern and follow the program, under the supervision of the advisor, throughout his or her work at Northeastern. Forty-two quarter hours of work are needed to complete the program. With permission of the advisor, the student may take up to three graduate courses in any other department.

Examination

The student must pass an individual comprehensive examination based upon his or her own program of study. The examination will include the evaluation of a lecture/classroom presentation.

DESCRIPTION OF COURSES

All courses carry three quarter hours of credit unless otherwise specified.

GROUP I

(three quarter hours required)

30.8A1 Bibliography and Literary Historiography
Materials and techniques of research in English and American literature; bibliography, form, and content of papers and theses; problems of literary history.

GROUP II

(three quarter hours required)

30.8B1 Theories of Criticism
Modern critical theories including New Critical, psychoanalytic, and Marxist. *Course may not be used to satisfy group requirement.*

30.8C1 Historical Linguistics I
Written records; the classification of language; phonetics and phonetic change; the comparative method; dialect geography.

30.8C2 Historical Linguistics II
Continuation of 30.8C1. Fluctuation; analogic and semantic change; cultural, intimate, and dialect borrowing. *Prep. 30.8C1.*

30.8C4 Semantics
The relation between language and behavior; the concept of change, variety, and uniqueness; symbols; levels of abstraction; habits of evaluation of linguistic phenomena; and modification of such habits in the direction of human adjustment, understanding, and survival.

30.8C5 History of the English Language I
The nature and origin of language; ancestry and early growth of English; phonetics, sound-change, and history of English sounds; history of English inflections; sources of the vocabulary; the making of words.

30.8C6 History of the English Language II
Semantic change; syntax and usage; dictionaries, spelling, pronunciation, variations, and usage. *Prep. 30.8C5*

30.8C7 Language and Its Structure
Introduction to the study of language, the principles and methods of linguistic description; the development of the science of language, of descriptive and generative linguistics. Emphasis on goals of modern linguistic theory.

30.8D1 Introduction to Old English

30.8D6 Chaucer's Troilus and Criseyde and Other Poems
The Book of the Duchess, The House of Fame, and *Troilus and Criseyde,* with a look at *The Romaunt of the Rose.*

30.8D7 Chaucer's Canterbury Tales

GROUP III

(three quarter hours required)

30.8E1 Tudor Literature
Wyatt and Surrey, Sidney, Raleigh, and the beginnings of prose fiction.

30.8E4 Renaissance Drama
Twelve representative Elizabethan and Jacobean comedies and tragedies.

30.8F1 Seventeenth-Century Literature
Major prose and poetry of the seventeenth-century, excluding drama: Bacon, Hobbes, Browne, Bunyan, Donne, Herbert, Jonson, Marvell, and others.

GROUP IV

(three quarter hours required)

30.8G1 Restoration and Early Eighteenth Century Literature
A critical study of neoclassical drama, poetry, and criticism: Restoration drama, Dryden, Pope, Addison, Steele and Gay.

30.8G6 Age of Johnson
Johnson, Boswell, and the Club: Burke, Goldsmith, and Gibbon; poetry of Cowper, Gray, Burns, and Smart.

30.8H1 Romanticism
General introduction to English Romanticism as an intellectual and artistic movement.

30.8J1 Victorian Literature
General survey touching upon major genres of Victorian literature with emphasis on the transition from the Victorian to the "modern." Such writers as Carlyle, Ruskin, the Brontes, Swinburne, Pater, Wilde.

30.8K1 Twentieth-Century British Literature
Theme and structure in the work of several dramatists from Shaw to Osborne and of several novelists from Conrad to Anthony Powell with an emphasis on major trends in the novel and in drama during the present century. *Course may not be used to satisfy group requirement.*

GROUP V

(three quarter hours required)

30.8L1 American Literature to 1830
A survey of American literature during its first two centuries, from the Puritans to the Knickerbockers, from William Bradford to James Fenimore Cooper.

30.8M1 Nineteenth-Century American Literature
A critical examination of selected works of prose and poetry by major writers of the period: Poe, Hawthorne, Melville, Thoreau, Dickinson, and Longfellow.

30.8N1 Twentieth-Century American Literature
Chance collisions: Adams, Dreiser, Crane, Dos Passos, Fitzgerald, Cozzens, Faulkner. The beginnings and development of Naturalistic fiction.

SEMINARS

(Fifteen quarter hours of seminar courses are required, of which three credits must be in a pre-nineteenth-century period.)

30.9B1 Critical Schools
The subject of this year's seminar will be structuralism and formalism.

30.9B3 English Prose Style
The development of prose style in English (chiefly expository), from the sixteenth century to the present. Most major authors are represented, from Roger Ascham to James Baldwin.

30.9B4 Short Fiction
The short stories of Sherwood Anderson and Ernest Hemingway and their contribution to American literature.

30.9B5 Comic Drama
The Comic Spirit and its manifestations in dramatic literature and performance. The nature and forms of comic playwriting from Aristophanes to the present. An examination of the theater's comic forms: farce, comedy, satire, parody.

30.9B6 Tragic Drama
This course will consider important theories of tragedy and certain plays in an effort to consider the relation, if any, which exists between theory and practice of the tragic genre.

30.9B7 Theatrical Styles
An examination of modern dramatic expression and theory. The course will give particular attention to absurdist drama, existentialist drama, and Brecht's theatre of alienation.

30.9B8 Humor in Literature

30.9B9 Satire
A theoretical study of satiric forms, Roman, Renaissance and neoclassical verse satire, and later satiric narratives. Writers surveyed: Horace, Juvenal, Pope, Swift, Voltaire, Byron, Evelyn Waugh, etc.

30.9C1 Phonetics and Dialectology
Mastering of the International Phonetic Alphabet (IPA) and of a standard phonemic alphabet; their application to practical work in recording and studying both standard speech and dialects.

30.9C2 Descriptive Linguistics
Intonation (stress, pitch, juncture); phonemics; morphemes and morphology; syntactic devices; the process of communication; variation in speech; etc. *Prep. 30.9C1.*

30.9C5 Transformational and Generative Grammar of English
Deep and surface structures and transformations necessary to generate the latter; graphic representations of structure; deep-structure nature of adjectives, pronouns, prepositions, auxiliaries, possessives, etc.; comparison with traditional grammar.

30.9C7 Linguistics and Literary Study
Language viewed in its special function as literary medium. Linguistic approach to style, metaphor, form and meaning. Representative works of major writers, poetry and prose, studied for characteristic formal properties. Discussion of contribution of linguistic analysis to literary criticism, and to a theory of literature.

30.9D1 Beowulf
Prep. 30.8D1

30.9D2 Old English Poetry
Prep. 30.8D1

30.9D5 Middle English Lyrics and Drama
A study of the epic and romance, concentrating on the transformation of the epic to the courtly hero: works to include in translation *Beowulf, Chretien de Troyes,* the *Nibelungenlied,* and *Le Morte D'Arthur.*

30.9D8 Studies in Fourteenth-Century Literature
Major works in Middle English including *Sir Gawain and The Green Knight, The Pearl,* and *Piers Plowman.*

30.9E1 Studies in Renaissance Poetry
Shakespeare, Marlowe, Jonson *et al.*

30.9E4 Jacobean Drama
About ten plays, mostly tragedies (except for Jonson); the course presumes a knowledge of Shakespeare's late tragedies and romances.

30.9E5 Shakespeare's Histories
The English history plays from *Richard III* to *Henry V,* plus *Titus Andronicus, Julius Caesar,* and *Troilus and Cressida.*

30.9E6 Shakespeare's Tragedies
Eight Plays from *Richard II* to *Antony and Cleopatra.*

30.9E7 Shakespeare's Comedies
Eight plays from *Comedy of Errors* to *The Tempest.*

30.9E8 Problems of Shakespearean Interpretation
A study of various "problematic" plays; a general knowledge of Shakespearean drama and the sonnets is presumed.

30.9F1 Metaphysical Poetry
Analysis of the structure and texture of poems by Donne, Herbert, and Marvell to determine the distinguishing characteristics of the metaphysical approach to poetry.

30.9F4 Seventeenth-Century Thought
Discussion of seventeenth-century theories on science, religion, politics, and art as expressed in Bacon, Burton, Browne, Locke, and Hobbes.

30.9F6 Milton's Major Poetry
Milton's poetic and intellectual achievement will be studied by analyzing his major works. Particular emphasis will be given to *Paradise Lost* as an expression of Renaissance humanism and the culmination of the epic tradition.

30.9G2 Restoration and Eighteenth-Century Drama
Plays of Etherege, Wycherley, Dryden, Vanburgh, Congreve, Gay, Lillo, Goldsmith, and Sheridan.

30.9G3 Augustan Literature
Jonathan Swift and the tradition of satire.

30.9G5 Eighteenth-Century Thought
Images of London: ambivalence and satire in urban literature; a survey of novels, essays, plays and poetry treating of life in an urban milieu.

30.9G7 Eighteenth-Century Fiction
Novels by Defoe, Fielding, Richardson, Smollett, Sterne and Austen.

30.9G8 Individual Eighteenth-Century Novelist
Henry Fielding.

30.9H1 Romantic Poetry I
The First Generation: Wordsworth and Coleridge.

30.9H2 Romantic Poetry II
The Second Generation: Byron, Keats, and Shelley.

30.9H3 Problems of Romanticism
Romantic attitudes towards man in relation to himself, society, and the universe, and romantic attitudes towards individual man as Poet, with the impact these attitudes have upon the form and thematic substance of authentic and fictional autobiography in poetry and prose.

30.9H8 Individual Romantic Writer
Blake.

30.9J1 Early Victorian Poetry
Close study of Tennyson, Browning, Arnold.

30.9J2 Late Victorian Poetry
The Pre-Raphaelite circle, and the movement toward modernism: D. G. Rossetti, Swinburne, G. M. Hopkins.

30.9J5 Prose of the Victorian Age
Emphasis on late Victorian period and particularly on the development of prose forms such as utopian literature, fantasy, science-fiction, detective fiction and the imperial adventure story: Morris, Pater, Kipling, Wilde, Wells, Carroll.

30.9J7 Victorian Novel
Close study of major works by Dickens, Eliot, the Brontës, Hardy.

30.9J8 Individual Victorian Novelist
Recent critical approaches to the novels of Charles Dickens.

30.9K1 Early Twentieth-Century British Poetry
Twentieth-century poets whose work has shaped and established the modern tradition, or extended our understanding of the traditions of the past: Hardy, Yeats, Lawrence, Muir, Auden, Owen, Thomas.

30.9K2 Contemporary British Poetry
Graves, Larkin, Hughes, *et al.*

30.9K3 Individual Modern British Poet
W. H. Auden. A study of Auden's achievement as poet, critic, dramatist, and translator, in the context of his age.

30.9K4 Twentieth-Century Irish Renaissance
A study of the emergence of a distinctive Irish literary tradition through concentration on the work of the main figures of the Irish Literary Revival, with particular emphasis on Yeats, Joyce, Synge, and O'Casey; minor concentration will be on post-Revolutionary and contemporary Irish writers: O'Faolain, O'Connor, and Behan.

30.9K7 Twentieth-Century British Fiction
Major figures of the modern and the contemporary periods: Conrad, Joyce, Cary, Beckett, Braine, Fowles, Snow, Lawrence, Woolf, Murdoch, Lessing, Huxley.

30.9K8 Individual Modern British Novelist
James Joyce and William Beckett.

30.9L1 Puritanism
Edward Taylor and Jonathan Edwards.

30.9L2 Literature of the New Republic
The beginning of the American literary tradition in poetry, fiction, and drama, from Freneau to Cooper, 1765-1830.

30.9M1 Transcendentalism
From religious or metaphysical idealism to theories of self-transformation, with emphasis on Emerson and Thoreau and consideration of related figures such as Kant, Coleridge, Carlyle, William James, Mumford, Jung.

30.9M2 Nineteenth-Century American Poetry
The legacies of Whitman and Dickinson.

30.9M7 The Romance in America
An attempt to define American Romance through the study of Cooper's Leatherstocking novels, the major novels of Hawthorne, and Melville's *Moby Dick* and *Billy Budd.*

30.9M8 The Rise of Realism
An examination of Local Colorism, Realism, and Naturalism in the works of Twain, Howells, James, Dreiser, Norris, and readings in European Realism.

30.9N1 Twentieth-Century American Poetry
Twentieth-century poets who have struggled to establish a tradition for American

poetry and whose examples have dominated poetry up to the present: Robinson, Frost, Stevens, W. C. Williams, M. Moore, Eliot, Pound, Crane, Cummings, and the Fugitives.

30.9N2 Individual Modern American Poet
Wallace Stevens.

30.9N3 Contemporary American Poetry
Lowell, Bishop, Bronk, Roethke *et al.*

30.9N7 Modern American Novel
Comic Resistance: West, Ellison, Mailer, Hawkes, Barth. The exhaustion of possibilities and the post-modern idea of self.

30.9N8 Individual American Novelist
Hemingway and Fitzgerald.

30.9N9 Modern American Drama
Philosophic and aesthetic trends among such playwrights as O'Neill, Williams, Miller, Albee, Simon, and others.

30.9P2 Comedy of Disaster in 19th and 20th Century Novels

30.9P4 The American 1890s
Intensive study of the works of Stephen Crane with some attention to other writers of the period, including Howells, Frederic, Garland, and to the cultural milieu.

30.9P5 Literature of the American South
A study of the southern literary experience from early nineteenth-century to mid-twentieth, from Simms to Faulkner.

30.9P8 Art and Literature in the Victorian Period
Relationships of visual art, literature, and aesthetic theory in the Victorian period. Emphasis on Ruskin, Pre-Raphaelite circle, Pater, Whistler, Wilde.

30.9P9 Twain and James

30.9R1 Creative Writing I
Prose fiction.

30.9R2 Creative Writing II
Prose fiction.

30.9Z1 Thesis (maximum: 6 q.h.)
By arrangement.

30.9Z2 Directed Research
By arrangement.

history

Professors

Raymond H. Robinson, Ph.D., Chairman
Philip N. Backstrom, Jr., Ph.D.
Martha E. François, Ph.D.

Associate Professors

Ballard C. Campbell, Ph.D.
Norbert L. Fullington, Ph.D.
Donald M. Jacobs, Ph.D.
John D. Post, Ph.D.
Stanley R. Stembridge, Ph.D.

Assistant Professors

Charmarie J. Blaisdell, Ph.D.
William M. Fowler, Ph.D.
Gerald H. Herman, M.A.
Laverne J. Kuhnke, Ph.D.
Martin R. Ring, Ph.D.

THE MASTER'S DEGREE

Admission

In addition to the admission requirements listed on page 22, applicants must have had a program which includes at least 15 semester hours of history. Applicants for the Fall Quarter who submit their application and all supporting documents by March 15 will be notified on or about April 1. Students who are interested in financial assistance *must* file all material by March 15.

Program

Forty-two quarter hours of academic work are required. Full-time students take four courses each quarter, thereby completing 36 quarter hours during the Fall, Winter, and Spring Quarters. The remaining credits may be taken during the summer sessions preceding or following the normal academic year.

All students must take the following courses:

23.800 Methodology
either 23.801 European Historiography or 23.900 American Historians

Two courses specifically labeled "seminar." except that students writing theses need take only one seminar.

Students must complete 23.800 prior to enrolling in seminars, and grades of at least B must be obtained in the seminars.

Students must complete at least one course (three quarter hours) in each

of three areas: Group I, Europe; Group II, United States; and Group III, Other Regions.

Group requirements will not be satisfied by the historiography courses, 23.801 and 23.900, or by 23.894, 23.895, 23.896 and 23.898. Courses are identified by group in the course list below.

With the approval of the faculty adviser, a maximum of nine quarter hours may be elected from graduate courses in other departments and a maximum of 12 quarter hours may be elected from advanced undergraduate courses in history.

A thesis is optional with the approval of the chairman of the department. If approved, a thesis carries nine quarter hours of credit.

Comprehensive Examination

All degree candidates must pass a comprehensive examination.

Language Requirement

Proficiency must be demonstrated in a foreign language approved by the department.

Financial Aid

In addition to teaching and tuition assistantships, there is a scholarship in memory of Professor Robert A. Feer, a member of the Department of History from 1963 to 1970.

DESCRIPTION OF COURSES

All courses carry three quarter hours of credit unless otherwise specified.

23.800 Methodology
The objectives, methods, and resources of the historian.

23.801 European Historiography
The development of historical writing from ancient times to the present.

23.802 Ancient Greece (Group I)
Selected topics in the history of ancient Greece.

23.803 Ancient Rome (Group I)
Selected topics in the history of Rome in the period of the Republic or the Empire.

23.806 Intellectual History of Europe, 1688 - 1789 (Group I)
The broad spectrum of eighteenth-century thought, with emphasis on scientific religious, and political ideas.

23.807 Intellectual History of Europe, 1789-1870 (Group I)
The great age of liberal and nationalistic thought. Social problems created by industrialism and various proposals to solve these problems will be examined.

23.808 Intellectual History of Europe, 1870-1950 (Group I)
The intellectual developments which have brought Europe to its present position in world affairs. Topics considered include theories of evolution, scientism, radical socialism, and fascism.

23.809 Seminar in European Intellectual History (Group I)
Research and writing on special topics in European intellectual history.

23.810 Social History of Europe, 400-1350 (Group I)
A study of society in the "Age of Faith," with special emphasis on aspirations, way of life, and cultural achievement.

23.811 Social History of Europe, 1350-1650 (Group I)
A study of social structure, standards of living, aspirations and frustrations, and cultural achievement in an age of Black Death, Renaissance, and religious controversy.

23.812 Social History of Europe, 1650 - 1850 (Group I)
Exploration of social development and cultural achievement in an age of revolutions — intellectual, political, agricultural, and industrial.

23.813 Economic History of the Modern Western World (Group I)
Topical analysis of the economic development of the modern western world.

23.817 Medieval Institutions (Group I)
Political, economic, and religious institutions in England and France from the fourth to the thirteenth centuries.

23.818 Seminar in the Renaissance (Group I)
Research and writing concerning the Renaissance.

23.819 Seminar in the Reformation (Group I)
Research and writing concerning the Reformation.

23.820 The Renaissance (Group I)
European political and cultural life from the thirteenth to the seventeenth centuries, with attention to Humanism and to the rebirth of classicism in literature and the arts.

23.821 The Reformation (Group I)
The development of the Christian Church from the thirteenth to the seventeenth centuries, with attention to the conflict between church and state, the impact of the Renaissance, the rise of the Protestant sects, and the wars of religion.

23.822 European Urban History to 1750 (Group I)
A study of urban places from Roman times to 1750 with special consideration of origins; layouts; political, economic, and social life; and the effects of towns on society.

23.823 European Urban History since 1750 (Group I)
A study of urban places since 1750 with attention to the growth of population, industrialization, and bureaucratization and attendant problems.

23.827 Seminar in England, 1558-1660 (Group I)
A study of political, religious, social, and economic problems from Elizabeth I to the Restoration.

23.830 Britain, 1688-1815 (Group I)
Topics include constitutional evolution, political parties, social and economic change, religious and intellectual developments, cultural achievements, and Scotland and Ireland.

23.831 Britain, 1815-1914 (Group I)
Aspects of nineteenth-century Britain, including reform of parliament, liberalism and socialism, the Irish question, imperialism, and Victorian ideals and attitudes.

23.832 Seminar in Twentieth-Century Britain (Group I)
Selected topics for research and writing.

23.833 Seminar in Nineteenth-Century Britain (Group I)
Selected topics for research and writing with special emphasis on the social effects of industrialization.

23.835 France, 1180-1661 (Group I)
The history of France from the time of Philip II to the majority of Louis XIV with special emphasis on the problems of cultural, political, and economic unity and the effects of the Renaissance and the Reformation.

23.836 France, 1661-1830 (Group I)
A study of the "Old Regime," including an examination of the reign of Louis XIV, the decline of the French monarchy in the eighteenth century, and the general effects of the Enlightenment; an analysis of the revolutionary period, 1789 to 1830.

23.840 France and Germany, 1870-1918 (Group I)
Selected comparative topics in the Third French Republic and Wilhelmian Germany.

23.841 France and Germany since 1918 (Group I)
Selected comparative topics in French and German history since the First World War.

23.845 Seminar in Nineteenth-Century Europe (Group I)
Research and writing in European history from 1850 to 1900.

23.850 Seminar in Russian History (Group I)
A narrow period or special topic in Russian history. *The course presupposes a basic knowledge of Russian history and will require extensive work on a research paper.*

23.855 Socialism and Revolution (Group I)
Studies in the history of socialism and revolution from the early nineteenth-century utopias to the New Left of the 1960s.

23.860 Diplomatic History of Europe, 1815 - 1914 (Group I)
The foreign policies of the chief European powers, with emphasis on changing alliances and alignments, imperialistic rivalries, and efforts at international cooperation.

23.861 Seminar in Imperialism (Group I)
An inquiry into the motives underlying European expansion in the late nineteenth century.

23.862 Twentieth-Century Europe (Group I)
The political history of Europe since 1900, with attention to World War I, the rise of Communism and Fascism, the struggle for security in the western democracies, World War II, and the Cold War.

23.863 Seminar in Twentieth-Century Europe (Group I)
A study of a selected controversy in contemporary European History.

23.870 China to 1800 (Group III)
History of Chinese civilization from antiquity through Confucianism to the period of Western impact.

23.871 Modern China (Group III)
Revolution and institutional change in China from the nineteenth century to 1927.

23.872 Communism in China (Group III)
A study of the Chinese Communist movement from its origins in the 1920s to the present.

23.873 Japan to 1600 (Group III)
A survey of early Japanese history with special emphasis on the social, political, intellectual, and literary history of the medieval period.

23.874 Japan, 1600 - 1868 (Group III)
A study of the Tokugawa period, emphasizing the problems of late feudal control, urban and rural developments, social, intellectual, and literary history.

23.875 Modern Japan (Group III)
The history of Japan since the fall of the Tokugawa, emphasizing political and economic developments, especially after World War II.

23.881 Modern Africa (Group III)
A topical approach to the history of Africa since 1850.

23.883 History of the Islamic Peoples (Group III)
A study of the history, culture, and religion of the followers of Muhammad from 600 to 1800.

23.884 Modern Middle East (Group III)
A study of the Middle East in the twentieth century.

23.894 Seminar in History and Media
Students will explore such topics as the advantages and drawbacks of specific media, the uses and abuses of media in research and teaching, and the construction of media. Each student will participate in a research project involving the creation and/or evaluation of historically valid films, slide tapes, and other materials.

23.895 Approaches to World History
An interdisciplinary examination of the study of civilization emphasizing various methodologies and theories and testing them by studying specific historical periods and cultures.

23.896 Psycho-History
An introduction to the concepts, scholarship, problems, and directions of psycho-historical studies.

23.898 Population in History
An application of demographic theory to history.

23.900 American Historians
The writing of American history by Americans from colonial times to the present with emphasis on changes in both form and substance.

23.901 Recent Interpretations of American History (Group II)
The literature of American history since 1945.

23.905 Colonial America: The Seventeenth Century (Group II)
Exploration of the New World, settlement of the English North American mainland colonies, and the adaptation of European institutions and ideas to New World conditions.

23.906 Colonial America: The Eighteenth Century (Group II)
The expansion of the English colonies in the New World, the development of political and social institutions, and the sources of friction with England to 1763.

23.907 The American Revolution (Group II)
Topics in the history of the American Revolution from 1763 to 1783.

23.909 Seminar in Colonial and Revolutionary America (Group II)
Research and writing on some topic in American history prior to 1789.

23.910 American Social History, 1607-1815 (Group II)
The ethnic foundation of American society; the ways Americans made their living, and the ways in which they lived during the colonial and early national periods.

23.911 American Social History, 1815-1900 (Group II)
The King Cotton society of the South, the ferment of reform and industrialism in the North, the Civil War, and the materialistic civilization of the late nineteenth century.

23.912 American Social History, 1900-1950 (Group II)
The transformation of the naive and idealistic America of the early twentieth century to life in a world in which technology has far outstripped man's mental and moral capacity to cope with it.

23.920 Seminar in American Urban History (Group II)
The political, economic, and social history of America's major cities, with special emphasis on Boston's last century.

23.921 American Social Structure (Group II)
Survey of population, residential, family, ethnic, and class patterns in American history.

23.922 American Immigration and Ethnicity (Group II)
Analysis of immigration to the United States, ethnicity and assimilation, and ethnic group diversity since 1800.

23.924 Topics in American Reform (Group II)
Selected studies of movements to change aspects of American Society.

23.935 Seminar in Recent American History (Group II)
Special topics from the period 1896 to 1960 will be studied in detail, and students will present a research paper on a major person, action, or movement.

23.937 American Politics, 1800-1877 (Group II)
The development of politics and parties in the nineteenth century.

23.938 American Politics, 1877-1920 (Group II)
Analysis of political patterns in the "transition" period.

23.939 Seminar in American Political History (Group II)
Research and writing on problems in American political history.

23.940 American Politics since 1920 (Group II)
Analysis of recent politics, emphasizing the Presidency, voting behavior, and party activity.

23.941 American Diplomatic History, 1775-1889 (Group II)
The history of American foreign policy and foreign relations from the American Revolution to 1889.

23.942 American Diplomatic History since 1889 (Group II)
The United States in the age of world involvement and responsibility; the imperialistic episode; the world wars; international organizations and alliances.

23.943 Seminar in American Diplomatic History (Group II)
Research and writing on selected topics in the history of American foreign relations.

23.945 Topics in the Civil War and Reconstruction (Group II)
Analysis of key issues surrounding the events leading up to the Civil War, the war itself, and the Reconstruction period.

23.962 Archival Administration I
An introduction to the archival administration with attention to theory and practice of archives and the relation of archives to other historical agencies.

23.963 Archival Administration II
Field work experience in archives or other historical agencies under the direction of agency administrators and Northeastern faculty. *Prerequisite 23.962.*

23.967 Afro-American History I (Group II)
The history of Afro-Americans to 1900, with emphasis on the role of black people in slavery and freedom.

23.968 Afro-American History II (Group II)
The history of Afro-Americans since 1900.

23.969 Seminar in Afro-American History (Group II)
Research and writing on some aspect of Afro-American history.

23.970 The United States and the Caribbean Region (Group II)
The Caribbean policy of the United States from the Monroe Doctrine to the present.

23.971 Mexican History (Group III)
The making of modern Mexico from its Indian and Spanish beginnings to the present.

23.973 South America to 1900 (Group III)
The European impact on South America, the movements for independence, and the nineteenth-century history of the new republics.

23.974 South America since 1900 (Group III)
The internal developments of the South American republics and their relations with one another and with other nations in the twentieth century.

23.975 Seminar in South American History (Group III)
Research and writing on special topics in the history of the South American republics.

23.990 Assigned Reading in History (1 q.h.)
Assigned reading under supervision of a faculty member.

23.991 Thesis (9 q.h.)
Thesis supervision by members of the department.

mathematics

Professors
David I. Epstein, Ph.D.
Bohumil Cenkl, D.Sc.
Holland C. Filgo, Jr., Ph.D.
Arshag Hajian, Ph.D.
Flavio B. Reis, Ph.D.
Gabriel Stolzenberg, Ph.D.
Harold L. Stubbs, Ph.D.
Jack Warga, Ph.D.

Associate Professors
Samuel J. Blank, Ph.D.
Mark Bridger, Ph.D.
Alberto R. Galmarino, Ph.D.
Maurice E. Gilmore, Ph.D., Chairman
Eugene Gover, Ph.D.
Robert D. Klein, M.S.
Nancy J. Kopell, Ph.D.
Richard A. Rasala, Ph.D.
Thomas O. Sherman, Ph.D.
Victor R. Staknis, Ph.D.

Assistant Professors
Harriet Fell, Ph.D.
John Frampton, Ph.D.
Nishan Krikorian, Ph.D.
Jayant Shah, Ph.D.
Brian Smith, Ph.D.
Betty Stark, Ph.D.

Instructor
John Casey, B.S.

Admission

In addition to the admission requirements listed on page 22, applicants should have a background which includes courses in linear and modern algebra and mathematical analysis.

THE MASTER'S DEGREE

Full-Time Program

Forty hours of course work are required for the degree. The following courses are required.

		Credits
10.9A1	Basic Analysis and Topology	4
10.9A2	Algebra A	4
10.9A3	Integration	4
10.9A4	Algebra B	4
10.9A5	General Topology	4
10.9A6	Complex Variables	4
10.9A7	Geometry	4
		28

The remaining 12 credits required for the master's degree may be selected from any graduate mathematics courses with the approval of the student's faculty adviser. In some cases, courses in other departments may be approved.

A full-time candidate for the master's degree will normally take the courses listed above in the first four quarters of graduate study, according to the following schedule:

Fall Quarter		Credits
10.9A1	Basic Analysis and Topology	4
10.9A2	Algebra A	4

Spring Quarter		Credits
10.9A4	Algebra B	4
10.9A7	Geometry	4

Winter Quarter		Credits
10.9A3	Integration	4
10.9A5	General Toplogy	4

2nd Fall Quarter		Credits
10.9A6	Complex Variables	4

Part-Time Program

Students in this program may progress according to their abilities and the time available. If students are deficient in any of the mathematics courses required for admission to the degree program, they will be required to satisfy their deficiencies by taking courses given for this purpose. Such courses will carry graduate credit, but the credit will be in addition to the regular degree requirements. The following courses are required:

	Total Credits
10.8C1 General Topology I	2
10.8D1, 10.8D2 Theory of Functions of a Real Variable I, II	4
10.8J1, 10.8J2, 10.8J3 Theory of Functions of a Complex Variable I, II, III	6
10.8P1, 10.8P2, Algebra I, II	4
	16

The remaining 24 quarter hours may be selected from graduate mathematics courses. With the approval of the department, a maximum of 10 of these elective credits may be selected from courses in other departments in the Graduate School of Arts and Sciences or the Graduate School of Engineering.

Other Requirements

There is no comprehensive examination and no language requirement for the master's degree. A thesis is not required but may in some cases be substituted for an elective course with the approval of the department.

THE DOCTOR OF PHILOSOPHY DEGREE

Admission

Students who have completed the first year of the full-time master's degree program or who have obtained a master's degree at another institution are eligible for admission to the doctoral program. Students who wish to earn the doctor's degree should inform the chairman of the graduate committee of their desire to be doctoral candidates. Those who have been accepted as doctoral candidates will remain in that category as long as their progress is deemed satisfactory.

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work.

Degree Candidacy

Degree candidacy is established in accordance with the general graduate school regulations.

Course Requirements

The course requirements, in addition to the minimum master's degree requirements of 40 quarter hours of credit, are established by the departmental graduate committee for each candidate. In most cases, 40 quarter hours of additional work will be required.

Independent Work

Before starting their dissertation, doctoral students may be required to do some kind of independent project, possibly, but not necessarily, in conjunction with departmental seminars or courses. The aim of the project is to start students on independent work and to give them a practical way to learn research techniques. Students should, with the help of their advisers, choose a topic they want to investigate. In studying it, students should read texts and journal articles and learn what to read and what not to read. In addition, they should try to solve problems, compute examples, modify proofs, and see whether or not the known results can be extended. Students should report on their work either in seminars or by giving a special lecture or writing up a short paper.

Minor Specialty

Each doctoral candidate will select some specific mathematical subject of an advanced nature, which must be reasonably unrelated to the topic of the student's dissertation. By means of reading, lecture courses, and/or seminars, the student should render work in this area equivalent to a good part of one full year's course work. Approval of the area and the plan of work should be obtained in advance from the Ph.D. committee.

Language Requirements

Ability to read and translate mathematical texts and journals in two foreign languages must be established by each candidate. The languages may be chosen from French, German, and Russian; any other choice requires special approval. The students should notify the chairman of the departmental graduate committee when they are prepared to be examined on each language. At least one language examination must be passed before beginning work on the dissertation. The examinations are conducted by members of the faculty of the mathematics department.

Teaching Requirement

Some teaching experience is required. This requirement may be satisfied by at least one year of service as a teaching assistant or by suitable teaching duties.

Dissertation

After the successful completion of their independent work when required, students shall select a dissertation adviser under whose guidance they will write their doctoral dissertation. They may be assisted by the departmental graduate committee in that selection if they wish it. The dissertation itself must represent an original solution of a problem in the chosen area of mathematics which makes some contribution to mathematical knowledge.

Final Oral Examination

This examination on the dissertation will be held in accordance with the graduate school regulations.

DESCRIPTION OF COURSES

The following courses are offered for those who wish to enter the master's degree program in mathematics, but who fail to satisfy the admission requirements in algebra and/or analysis. These courses will be taken in addition to the required course work in mathematics.

10.8B1, 10.8B2, 10.8B3 Abstract Algebra I, II, III (2 q.h.)
Groups, subgroups, normal subgroups, rings, ideals, integral domains, and fields. *Prep. Differential and Integral Calculus.*

10.8B4 Advanced Calculus I (2 q.h.)
Functions of one independent variable; limits, continuity, differentiability. Properties of continuous functions on a closed bounded interval. Rolle's theorem and the mean-value theorem. *Prep. Differential and Integral Calculus.*

10.8B5 Advanced Calculus II (2 q.h.)
Functions of several independent variables. Distance and open sets; limits, continui-

ty. Properties of continuous functions on a closed bounded set. Differentiability and differentials, mean-value theorem, implicit function theorems, Jacobians and transformations. *Prep. 10.8B4.*

10.8B6 Advanced Calculus III (2 q.h.)
Sequences, sequences of functions, uniform convergence, series. Integration, line and surface integrals. *Prep. 10.8B5.*

The following courses may be used toward the degree requirements in mathematics.

10.8C1, 10.8C2 General Topology I, II (2 q.h.)
Sets and maps, metric spaces, topological spaces, separation axioms, compactness, connectedness. *Prep. 10.8B6 or equivalent.*

10.8D1 Theory of Functions of a Real Variable I (2 q.h.)
Lebesque measure on real line, measurable functions, Lebesque integral, convergence theorems, bounded variation, absolute continuity. *Prep. 10.8C1.*

10.8D2 Theory of Functions of a Real Variable II (2 q.h.)
Classical Banach spaces, integration theory on abstract measure spaces, signed measures, Radon-Nikodym theorem, product measure, Fubini theorem. *Prep. 10.8D1.*

10.8E1 Advanced Differential Equations I (2 q.h.)
First order differential equation; existence and uniqueness theorems; dependence of solution on parameter. Stability theory. Periodic solutions. *Prep 10.8B6.*

10.8E2 Advanced Differential Equations II (2 q.h.)
Systems of first order differential equations. *Prep. 10.8E1.*

10.8E3 Advanced Differential Equations III (2 q.h.)
Selected topics, including asymptotic behavior of solutions. *Prep. 10.8E2.*

10.8E4 Partial Differential Equations I (2 q.h.)
Partial differential equations of first order; Cauchy-problem; Cauchy-Kowalewski theorem. Method of characteristics. *Prep. 10.8B6.*

10.8E5 Partial Differential Equations II (2 q.h.)
Classification of second order equations. Well-posed problems. Emphasis on hyperbolic equations. *Prep. 10.8E4.*

10.8E6 Partial Differential Equations III (2 q.h.)
Emphasis on elliptic equations. *Prep. 10.8E5.*

10.8E8, 10.8E9 Integral Equations I, II (2 q.h.)
Equations of Volterra and Fredholm. Symmetric kernals. Orthogonal systems of functions. Applications. *Prep. 10.8B6 or equivalent.*

10.8F1 Difference Equations (2 q.h.)
Formulation and solution of difference equations; approximate solution of engineer-

ing problems by finite-difference methods; relaxation techniques; stability and convergence of approximate methods; applications. *Prep. 10.8B6 or equivalent.*

10.8F3, 10.8F4 Calculus of Variations I, II (2 q.h.)
The concept of the first variation of a functional; the simplest variational problem; Euler's equation. Generalization to several variables. Hamilton-Jacobi theory. Sufficient conditions for extrema. Fields of extremals. Direct methods in variational problems. *Prep. 10.8B6.*

10.8G1 Probability I (2 q.h.)
Fundamentals of probability theory; discrete and continuous probability distributions, including binominal, Poisson, and normal; law of large numbers and central limit theorem. *Prep. Differential and Integral Calculus.*

10.8G2 Probability II (2 q.h.)
Further study of probability distributions for one or more random variables. Special topics such as counting processes and Markov chains. *Prep. 10.8G1.*

10.8G4 Mathematical Statistics I (2 q.h.)
Fundamental statistical methods. Tests of significance and estimation based on large or small samples; simple correlation and linear regression. *Prep. 10.8G1 or equivalent.*

10.8G5 Mathematics Statistics II (2 q.h.)
Further topics in statistical inference, including analysis of variance. *Prep. 10.8G4.*

10.8G8 Stochastic Processes (2 q.h.)
Processes with independent increments. Strict and wide sense stationary processes. Markov processes. Renewal processes. Queuing problems. *Prep. 10.8G2.*

10.8H4 Statistical Decision Theory (2 q.h.)
Subjective Probability. Utility. Bayesian approach to statistical decision problems. *Prep. 10.8G1 or 10.8G4.*

10.8J1 Theory of Functions of a Complex Variable I (2 q.h.)
Geometry of the complex pane, analytic functions, Cauchy's theorem. *Prep. 10.8C1 (may be taken concurrently).*

10.8J2 Theory of Functions of a Complex Variable II (2 q.h.)
Infinite sequences and series, singularities, residues, applications. *Prep. 10.8J1.*

10.8J3 Theory of Functions of a Complex Variable III (2 q.h.)
Meromorphic functions, Mittag-Leffler theorem, conformal mapping. *Prep. 10.8J2.*

10.8K1 Fundamental Questions of Mathematics: An Introduction to Mathematical Logic (2 q.h.)
A discussion of truth tables, propositional calculus with applications, theories and models, and Godel's incompleteness results. The course stresses the way in which Mathematical Logic raises and solves problems in number theory, set theory, analysis, and geometry. *Prep. none.*

10.8K2 A First Course in Mathematical Logic (2 q.h.)
Propositional calculus, quantificational logic, first order theories through the Skolem-Lowenheim Theorem. *Prep. none.*

10.8K3 An Introduction to Recursive Function Theory (2 q.h.)
Turing machines. Partially computable functions. Primitive recursive and general recursive functions and predicates. Unsolvable decision problems. Recursively enumerable sets of integers. The unsolvability of Hilbert's Tenth Problem. *Prep. none.*

10.8K4 Godel's Incompleteness Theorems (2 q.h.)
Formal number theory. Arithmetization. Godel's First and Second Incompleteness Theorems for formal number theory. *Prep. a knowledge of the methods of mathematical logic.*

10.8K5 Set Theory (2 q.h.)
The informal study of sets, including detailed discussion of the axiom of choice, well-ordered sets, and transfinite arithmetic. *Prep. none.*

10.8K6 Formal Set Theory (2 q.h.)
Versions of axiomatic set theory. The consistency of the continuum hypothesis and the axiom of choice. As time permits, the independence of the continuum hypothesis and the axiom of choice. *Prep. the equivalent of 10.8K2 and 10.8K5.*

10.8L1, 10.8L2 Numerical Analysis I, II
Solutions of algebraic and trascendental equations. Approximation and interpolation. *Prep. 10.8B6 or equivalent.*

10.8P1, 10.8P2, 10.8P3 Algebra I, II, III (2 q.h.)
The content of these courses is the same as 10.9A2 and the first part of 10.9A4. *Prep. 10.8B2 or equivalent.*

10.8T1, 10.8T2 Matrix Analysis I, II (2 q.h. each)
Solutions of systems of linear equations; matrix inversion, characteristic values, canonical forms. Hermitian, orthogonal and unitary matrices. Matrix calculus. *Prep. 10.8B6 or equiv.*

10.8T3 Tensor Analysis I (2 q.h.)
Tensor algebra; review of three-dimensional point and vector spaces in the setting of tensor analysis. Linear algebra and n-dimensional affine space. The coordinate tensor, tensor products, invariants, physical components. *Prep. 10.8B6 or equivalent.*

10.9A1 Basic Analysis and Topology (4 q.h.)
Sets and functions. Metric spaces with examples. Continuous functions. Notions of compact, complete, paracompact spaces. Function spaces, especially Banach and Hilbert spaces. Multilinear maps. Coordinate-free calculus, inverse and implicit function theorems, Taylor formula, first-order differential equations.

10.9A2 Algebra A (4 q.h.)
Groups, rings, modules: basic properties and examples. Linear algebra from an advanced standpoint; exactness and techniques of ring theory. Free groups, generators

and relations, finitely generated abelian groups, Sylow theorems. Other topics as time permits.

10.9A3 Integration (4 q.h.)
Measure spaces. Abstract Lebesque integral. Convergence theorems. Construction of Lebesque measure on R^n. Radon-Nikodym theorem. Product measure theorem. Fubini's theorem.

10.9A4 Algebra B (4 q.h.)
Polynomial functions and formal polynomials. Polynomial rings and unique factorization. Construction of extension fields. Splitting fields of polynomials. Theory of fields and Galois theory. Examples.

10.9A5 General Topology (4 q.h.)
General topological spaces. Moore-Smith convergence. Compactness and connectedness. Separation properties. Products, Quotient spaces. Inductive and projective limits. Function spaces. Elementary homotopy. Some of the functorial viewpoint.

10.9A6 Complex Variables (4 q.h.)
Elementary properties of holomorphic functions, harmonic functions, maximum modulus principle, approximation theorems, conformal maps, zeroes of holomorphic functions, anaiytic continuation.

10.9A7 Geometry (4 q.h.)
Fundamental group, covering spaces, simplicial complexes, manifolds, orientation, linear group manifolds. Some attempt to tie up algebra and topology.

10.9B3 Constructive Algebra (4 q.h.)
A constructive development of some of the old familiar areas of algebra: principal ideal domains, Dedekind domains, factorial domains, Noetherian rings.

10.9B7, 10.9B8 Philosophy of Science & Mathematics I, II (4 q.h. each)
Topics may vary from year to year. Past subjects have included the foundations of statistical inference, the structure of scientific theories and an analysis of the conceptual structure of mathematics.

10.9B9 Seminar: Constructive Mathematics (4 q.h.)

10.9C1, 10.9C2 Functional Analysis A, B (4 q.h.)
Topological vector spaces, Banach spaces, Hilbert spaces, algebras of operators, representations.

10.9E1 Advanced Differential Equations (4 q.h.)
The Material of 10.8E1 and 10.8E2 is covered as a unit in 10.9E1. *Prep. 10.9A1.*

10.9E3, 10.9E4 Partial Differential Equations A, B (4 q.h.)
Treats a selection of the material of 10.8E4, 10.8E5 and 10.8E6. *Prep. 10.9A1 and 10.9A6.*

10.9E6 Integral Equations (4 q.h.)
Covers material from 10.8E8, 10.8E9. *Prep. 10.9A1.*

10.9F1 Optimal Control Theory A (4 q.h.)
Analytical preliminaries (special theorems on measure and integration, differentiation in Banach spaces, differential equations, convex sets, representation of special linear functionals, etc). Relaxed controls and the existence of optimal relaxed solutions and approximate solutions. Necessary conditions for minimum with and without unilateral restrictions for problems defined by ordinary differential equations. *Prep. 10.9A1, 10.9A3.*

10.9F2 Optimal Control Theory B (4 q.h.)
Selected topics such as problems with minimax controls, necessary conditions for optimal unrelaxed solutions, problems with unbounded controls, problems defined by functional-integral equations, necessary conditions without differentiability assumptions. *Prep. 10.9F1.*

10.9G1 Probability (4 q.h.)
Probability spaces. Probability laws of families of random variables. Distribution functions and characteristics functions on R^n. Strong limit laws of sums of independent random variables. Central limit theorem. Conditional expectations.

10.9H1 Mathematical Statistics (4 q.h.)
This course embodies the material in 10.8G4 and 10.8G5. *Prep. 10.8G1 or equivalent.*

10.9M5, 10.9M6 Lie Groups and Fourier Theory A, B (4 q.h.)
Certain questions in analysis take on a special simplicity due to the benevolent presence of an algebraic structure. Starting with simple classical examples, the course will work toward a deeper and more contemporary vision of Lie groups and Fourier theory. Ideas will outweigh proofs.

10.9N1 Advanced Mathematics A (4 q.h.)
Legendre and Bessel functions, Laplace transforms, Fourier integrals, boundary-value problems, introduction to matrix algebra. *Prep. Differential Equations. Not to be used for credit toward the program in mathematics.*

10.9N2 Advanced Mathematics B (4 q.h.)
This course embodies the material in 10.8A3 and 10.8A4. *Prep. 10.9N1. Not to be used for credit toward the program in mathematics.*

10.9P0 Seminar: Classical Groups (up to 4 q.h.)
Topics in classical groups as chosen by participants.

10.9P1 Representations of Groups (4 q.h.)
A basic course in group representations and character theory.

10.9Q1 Homological Algebra (4 q.h.)
Maps, sums, tensor products, exact sequences, homology, derived functors and adjoints, applications to algebra and topology.

10.9Q2 Module Theory (4 q.h.)
Techniques of commutative and homological algebra applied to modules and ideals. Applications to regular and Gorenstein rings.

10.9Q6 Ring Theory (4 q.h.)
A survey of ring theory. Commutative algebra and its geometric significance. Ideal and decomposition theory, semi-simple rings. Additional topics to be decided upon.

10.9U1, 10.9U2 Algebraic Topology A, B (4 q.h.)
Topics from: Homology groups, homology sequences, fiber spaces, sheaves, products in homology and cohomology, cohomology algebra, Kunneth theorems, Steenrod operations, Poincare duality, higher homotopy groups and the Hurewicz theorem, characteristic classes.

10.9W1, 10.9W2 Dynamical Systems A, B (4 q.h.)
Structural stability and qualitative theory of dynamical systems.

10.9W9 Seminar: Dynamical Systems (up to 4 q.h.)
Topics in dynamical systems as chosen by participants.

10.9Z1 Master's Thesis (up to 6 q.h.)

10.9Z2 Readings in Analysis (up to 4 q.h. per quarter)

10.9Z3 Readings in Algebra (up to 4 q.h. per quarter)

10.9Z4 Readings in Topology (up to 4 q.h. per quarter)

10.9Z5 Doctoral Dissertation

10.9Z6 Seminar in Analysis (up to 4 q.h. per quarter)

10.9Z7 Seminar in Algebra (up to 4 q.h. per quarter)

10.9Z8 Seminar in Topology (up to 4 q.h. per quarter)

physics

Professors
Roy Weinstein, Ph.D.
Chairman
Ronald Aaron, Ph.D.
Petros N. Argyres, Ph.D.
Richard L. Arnowitt, Ph.D.
Alan H. Cromer, Ph.D.
Marvin H. Friedman, Ph.D.
David A. Garelick, Ph.D.
Marvin W. Gettner, Ph.D.
Michael J. Glaubman, Ph.D.
Hyman Goldberg, Ph.D.
Bernard Gottschalk, Ph.D.
Walter Hauser, Ph.D.
Giovanni Lanza, Ph.D.
Bertram J. Malenka, Ph.D.
Pran Nath, Ph.D.
Clive H. Perry, Ph.D.
Eugene J. Saletan, Ph.D.
Carl A. Shiffman, Ph.D.
Yogi N. Srivastava, Ph.D.
Michael T. Vaughn, Ph.D.
Eberhard von Goeler, Ph.D.
Thomas H. Wallace, Ph.D.
Fa-Yueh Wu, Ph.D.

Associate Professors
Evangelos M. Anastassakis, Ph.D.
Robert I. Boughton, Ph.D.
William L. Faissler, Ph.D.
Robert P. Lowndes, Ph.D.
James E. Neighbor, Ph.D.
Jeffrey B. Sokoloff, Ph.D.
Allan Widom, Ph.D.

Assistant Professors
Arun Bansil, Ph.D.

Research Associates
Paul S. Gauthier, Ph.D.
Ronald S. Longacre, Ph.D.
Michael L. Mallary, Ph.D.
Douglas M. Potter, Ph.D.
Giulia Srivastava, Ph.D.
Neal E. Tornberg, Ph.D.

Admission

Applicants for admission must have had, in addition to the requirements of the college, an undergraduate program which includes at least 12 semester hours of upperclass physics (beyond general physics) and courses in calculus and ordinary differential equations.

Students planning to enter graduate school should have in their upperclass undergraduate program the following courses or their equivalent:

11.200 - 11.201 Mechanics
11.211 - 11.212 Electricity and Magnetism
11.220 - 11.230 Thermodynamics, Kinetic Theory and Modern Physics
11.240 - 11.241 Quantum Mechanics

plus courses in advanced calculus, functions of a complex variable, fourier series and boundary value problems. (The numbers correspond to Northeastern courses which are listed among the introductory courses below.) Students whose background in one or more of these areas is weak will be asked to satisfy the prerequisites to the required courses by taking up to 9 q.h. of introductory courses.

All students admitted to the program must be interviewed by the department and arrangements for a program of study must be concluded before

registration. Appointments may be made in advance (though this is not usually necessary during regular office hours) by writing or calling the department [tel. (617) 437-2902].

The Program

There exists only one graduate program in the department, though some of our students are full-time, some are part-time, some leave with the M.S. and some continue on to the Ph.D.

The department is very active in research as evidenced by a publication rate of over 50 journal articles per year, a research support level of close to $1 million per year, and an internationally established reputation in experimental and theoretical high energy (particle) and solid state physics. The research done in the department is basic research of high quality, and is of significance to the fundamental development of physics.

THE MASTER OF SCIENCE DEGREE

Course Requirements

Forty-two quarter hours (q.h.) of graduate credit are required, of which up to 12 q.h. may be transfer credit on departmental approval, and up to 9 q.h. may be in introductory courses.

The following courses are required, for a total of 30 q.h. of graduate credit:

11:820*, 11.825	Mathematical Methods A,B,	(3 q.h.)
11.824, 11.826	Classical Mechanics A,B,	(3 q.h.)
11.834, 11.835, 11.836*	Electromagnetic Theory A,B,C	(3 q.h.)
11.841, 11.842, 11.843	Quantum Theory A,B,C	(4 q.h.)

*NOTE: Only one of these two courses is *required* for the M.S.

Students may take as electives any courses carrying graduate credit in physics, mathematics, engineering, chemistry, psychology, or biology, for which the student has adequate preparation.

Detailed course descriptions are listed below.

Sample Programs for Part-time Students

YEAR	F	W	Sp	F	W	Sp	F	W	Sp
I	11.820	11.211	11.212	11.820	11.240	11.241†	11.820† 11.824	11.825	11.826
II	11.824	11.825	11.826	11.824	11.825	11.826	11.834	11.835	11.836
III	11.834	11.835 11.240	11.836†	11.834	11.835 11.285†	11.836†	11.841	11.842	11.843†
IV	11.841	11.842	11.843	11.841	11.842	11.843	11.827†	11.828†	11.829†

†Electives

THE DOCTOR OF PHILOSOPHY DEGREE

Admission

A student's eligibility to take the Ph.D. qualifying examination is decided by a committee of the department on the basis of the student's overall performance. Full-time students will be notified of their status sometime in their second year of study. Students enrolled in the part-time master's degree program who wish to qualify for Ph.D. candidacy may so indicate by petition to the graduate committee of the department. The petition should include a timetable for completing the additional 33 (30 if he has had 11.836) quarter hours of required courses listed below and for taking the qualifying examination.

Course Requirements

The following courses are required in addition to the required courses for the M.S. degree:

11.827, 11,828, 11.829	Statistical Physics, A,B,C	(3 q.h.)
11.836	Electromagnetic Theory C	(3 q.h.)
11.848	Advanced Quantum Theory	(4 q.h.)
11.86A, 11.86B, 11.86C	Particle and Nuclear Physics A, B, C	(3 q.h.)
11.87A, 11.87B	Solid State Physics A,B	(4 q.h.)

Notice that while these courses add up to 33 q.h., 12 q.h. of the total may have been taken for the M.S., leaving only 21 q.h. of additional required courses for the Ph.D.

Sample Programs for Full-Time Ph.D. Students

YEAR	F	W	Sp	F	W	SP	F	W	SP
I	11.820	11.211	11.212	11.820	11.240	11.241	11.824	11.825	11.826
	11.824	11.825	11.826	11.824	11.825	11.826	11.834	11.835	11.836
	11.240	11.285†	11.241	11.834	11.835	11.836	11.841	11.842	11.843
II	11.834	11.835	11.836	11.841	11.842	11.843	11.827	11.828	11.829
	11.841	11.842	11.843	11.827	11.828	11.829	11.848	11.87A	11.87B
	11.827	11.828	11.829	**Electives**			11.86A	11.86B	11.86C
							Qualifying Exam		
III	11.848	11.87A	11.87B	11.848	11.87A	11.87B	**Thesis Research**		
	11.86A	11.86B	11.86C	11.86A	11.86B	11.86C	**and Advanced Electives**		
	Electives			**Electives**					
	Qualifying Exam			**Qualifying Exam**					
IV, V	**Thesis Research and Advanced Electives**								

†Suggested electives.

Qualifying Examination

The qualifying examination consists of a written and an oral part. The written examination covers the material in the required courses for the Ph.D. program. This examination is given twice a year, once in September and once in February. A student must take this examination during the next Fall Quarter following the quarter in which he became eligible to take it. If the examination is failed, it may be repeated for the second and last time on the next occasion it is given.

Residence Requirement

After a student has completed the required 63 q.h. (60 q.h. for students exempted from 11.820) of course work and has passed his qualifying examination, he becomes a doctoral degree candidate and must satisfy the residence requirement by one year of full-time graduate work.

Teaching Requirement

Some teaching experience is required. This requirement may be satisfied by at least one year of service as a teaching assistant or by suitable teaching duties.

Dissertation

The student should arrange for a dissertation adviser by the time he wishes to take the oral part of the qualifying examination. An outline of the dissertation must be approved by the departmental graduate committee at least eight months before the final dissertation examination (see below).

The student may choose his field of research according to one of the following options:

a) In one of the research areas in the department, under direct supervision of his adviser.

b) In one of the other research areas of the University, under the direct supervision of a researcher in that field. In that case, a joint committee including his direct supervisor, his departmental adviser, and one other member of the department will constitute his thesis committee.

c) In an area of applied research in one of the industries or non-profit institutions associated with the department's Industrial Ph.D. Program. His direct supervisor will be an employee of the institution where their research is done (and will have been accredited by the physics department); the rest of the thesis committee will be as in option (b) above.

Final Dissertation Examination

This examination will be held in accordance with the graduate school regulations.

DESCRIPTION OF COURSES

I. INTRODUCTORY COURSES

11.200 Mechanics I (3 q.h)
Vector analysis. Kinematics and dynamics of particle motion, generalized coordinates and Lagrange's equations of motion. *Prep. Basic Physics and Differential Equations.*

11.201 Mechanics II (3 q.h.)
Conservation theorems, central force motion, systems of particles, rigid body motion, Hamilton's equations. *Prep. 11.200.*

11.208 Introduction to Mathematical Physics
Review of linear algebra and vector calculus, special functions and partial differential equations of physics, potential theory, functions of a complex variable. *Prep. Differential Equations.*

11.211*, 11.212* Electricity and Magnetism I, II (3 q.h.)
A two-quarter sequence in electromagnetic theory, Maxwell's equations and their experimental basis, electrostatics and magnetostatics, the electromagnetic field in empty space, electromagnetic waves, energy and momentum in the electromagnetic field, electrodynamics, the interaction of matter and the field, radiation. *Prep. 11.208.*

11.230 Modern Physics (3 q.h.)
A review of experiments demonstrating the atomic nature of matter, the properties of the electron, the nuclear atom, the wave-particle duality, spin, and the properties of elementary particles. The course discusses, mostly on a phenomenological level, such subjects as atomic and nuclear structure, properties of the solid state, and elementary particles. *Prep. 11.200*

11.240* Quantum Mechanics I (3 q.h.)
The first of a two-quarter sequence in quantum mechanics. Observations of macroscopic and microscopic bodies. The uncertainty principle, wave particle duality, probability amplitudes, Schrodinger wave theory, and one-dimensional problems. *Prep. 11.208.*

11.241* Quantum Mechanics II (3 q.h.)
Continuation of 11.240. Discrete and continuous states, Schrodinger equation in three dimensions, angular momentum, general theory of quantum mechanics, application. *Prep. 11.240.*

11.285* Introduction to Nuclear Physics (3 q.h.)
Nuclear structure, nuclear masses, radioactivity, nuclear radiation, interaction of radiation and matter, detectors, fission, nuclear forces, elementary particles. *Prep. 11.230.*

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*These courses meet twice a week in the late afternoon and evening for 2 hours each time. The others usually meet 3 times a week in the day (except for 11.871, 11.872).

11.846, 11.847 Electronics and Data Analysis I, II (4 q.h.)
A two-quarter course intended to teach those electronic and data-analysis techniques that are common to research in all fields of experimental physics. Subjects in electronics will be: principles of semiconductor devices; analog techniques including feedback and servo loops, and wide-band amplification; digital techniques including integrated circuits and logic techniques; design of electronic subsystems such as counters, analog-to-digital converters and phase-sensitive detectors. Subjects in data analysis will be probability theory; distribution functions; fitting data with a hypothesis; error estimation. Time permitting, high-vacuum techniques, cryogenic techniques, and lasers may also be covered.

11.871 Radiation Physics (2 q.h.)
Introduction to atomic and nuclear physics for graduate students in biology and pharmacy. Topics include quantum mechanics and atomic structure, nuclear structure, radioactivity, properties of nuclear radiation, detection of radiation.

11.872 Radiation Biology and Health Physics (2 q.h.)
The effects of radiation on biological systems and the uses of radiation in medicine and biological research. Topics include dosimetry, effects of radiation on chemical reactions; effects of radiation on cells, organs, and individuals; theories of radiation damage; imaging and tracer techniques using radiopharmaceuticals; radiation safety and standards. *Prep. 11.871.*

II. REQUIRED REGULAR COURSES (Offered every year)

11.820 Mathematical Methods A (3 q.h.)
Theory of functions of complex variable. Analytic functions. Taylor and Laurent infinite series. Analytic continuation and classification of functions. Calculus of residues. Asymptotic series. Applications to ordinary differential equations and the study of special functions.

11.825 Mathematical Methods B (3 q.h.)
Finite dimensional linear vector spaces. Matrices and determinants. Function spaces, Hilbert space and Hermitian forms. Linear integral equations. Completely continuous operators. Generalized Fourier expansions generated by solutions of the Sturm-Liouville problem. Linear response theory. Green's functions. *Prep. 11.820 or equivalent.*

11.824 Classical Mechanics A (3 q.h.)
Newton's law. Central force motion. Constraints and generalized coordinates. Lagrangian formulation. Hamilton's variational principle. Transformation symmetries. Small oscillations and normal modes. Scattering theory and cross-sections.

11.826 Classical Mechanics B (3 q.h.)
Rigid body motion. Hamiltonian formulation. Poisson brackets and canonical transformations. Hamilton-Jacobi theory. Lagrangian and Hamiltonian formalisms of continuous media and fields. *Prep. 11.824.*

11.827 Statistical Physics A (3 q.h.)
The phenomenological theory of thermodynamics. Fundamental relations and thermodynamic potentials. Extremal principles of thermodynamics. Applications to simple systems. Stability conditions. Phase transitions. Thermodynamics of electric and

magnetic systems. Principles of irreversible thermodynamics. *Prep. 11.824; and 11.841 concurrently.*

11.828, 11.829 Statistical Physics B, C (3 q.h.)
The principles of statistical mechanics and statistical thermodynamics. Density matrix. Theory of ensembles. Derivation of the laws of thermodynamics. Fermi-Dirac and Bose-Einstein statistics. Application to gases, liquids, and solids. Theory of phase transitions. Second-quantization formalism for interacting systems. Co-operative phenomena. *Prep. 11.827, 11.841.*

11.834, 11.835, 11.836 Electromagnetic Theory A, B, C (3 q.h.)
Maxwell's equations. Static field and boundary value problems; multipole expansion. Phenomenology of dielectrics, conductors, and magnetic materials. Faraday's Law. Energy and momentum; Poynting vector; Maxwell stress tensor. Plane waves; polarization. Reflection and refraction; diffraction. Relativity. Radiation from sources. Motion of charged particles in electromagnetic fields; magnetic mirrors, particle accelerators. Introduction to plasma physics; magnetohydrodynamics. Radiation from accelerated charges; bremsstrahlung, synchrotron radiation. Scattering of radiation; interaction of radiation with matter. *Prep. 11.212, 11.820 (concurrently).*

11.841, 11.842, 11.843 Quantum Theory A, B, C (4 q.h.)
Experimental basis of quantum theory. Schrodinger equation and probability interpretation of wave mechanics. Uncertainty principle. Application to one dimensional problems, the harmonic oscillator, orbital angular momentum, and the central force problem. Quantum theory of scattering. Born approximation. Phase shift analysis. Introduction to S-matrix theory. General formulation of quantum mechanics in Hilbert space. Spin. Identical particles and symmetrization principle. Time-independent and time-dependent perturbation theory. Semi-classical theory of radiation and atomic spectra. Addition of angular momentum. Wigner-Eckart theorem. Quantum theory of radiation. Absorption, emission, and scattering of photons. *Prep. 11.240.*

11.848 Advanced Quantum Theory (4 q.h.)
Introduction to the formulation of a relativistic quantum theory. Study of the Dirac equation and its Lorentz covariance. Plane wave solution of the Dirac equation, and projection operators. Bound state solutions of the Dirac equation in a Coulomb field, and the hydrogen atom. Parity, charge conjugation, and time reversal symmetries. Propagator theory. *Prep. 11.843.*

11.86A, 11.86B, 11.86C Particle and Nuclear Physics A, B, C (3 q.h.)
The first quarter is a study of nuclear physics with emphasis on the nature of nuclear forces and its connection to particle physics. Phenomenological models are examined and compared with experimental results. The second and third quarters are a study of elementary particles and their interactions. A basic classification of elementary particles is made, along with a summary of their strong, weak, and electromagnetic interactions. Lorentz invariance and other symmetry principles are used to extract theoretical statements about scattering and decay amplitudes, and particle mass spectra. *Prep. 11.843 and concurrent with 11.848.*

11.87A, 11.87B Solid State Physics A, B (4 q.h.)
Adiabatic approximation and theory of lattice vibrations of perfect crystals. Phonons, polaritons, and their measurement. One-electron approximation of solids and theory

of Bloch electrons. Metals, semiconductors, and insulators. Thermal properties. Bloch electrons in external fields. Electron-phonon interaction. Electrical and thermal conductivity. Theory of transport phenomena. Magnetic properties. Amorphous solids. *Prep. 11.827, 11.842.*

III ADVANCED ELECTIVES

11.804, 11.805, 11.806 Advanced Solid State Physics A, B, C (4 q.h.)
Selected advanced topics in the theory of solids to be chosen each time by the interested students and instructor. E.g.: Theory of normal metals. Hartree-Fock and Random phase approximations. Optical and transport properties. Solid-state plasmas. Raman spectroscopy. Quasiparticles and collective excitations. Quantum solids. Amorphous solids, etc. *Prep. 11.829, 11.843, 11.87B.* Offered every other year.

11.817 Foundations of General Relativity
The course discusses the physical basis underlying relativity (the weak and strong principle of equivalence), the role of the metric tensor as a carrier of gravitational information, and the modification of the Lorentz covariant field equations in the presence of gravitation. An introduction to Riemannian geometry is given, and the Einstein field equations and tests of Einstein's theory are discussed. *Prep. 11.825, 11.826, 11.836, and 11.843.*

11.818 Relativistic Astrophysics and Cosmology
The course deals with the equations for the relativistic stellar system, white dwarfs, neutron stars and properties of pulsars, gravitational collapse and black holes, quantum radiation from black holes, super heavy stars as possible quasar energy sources, quantum effect in gravitational collapse, the metric for cosmological systems, and the big bang theory. *Prep. 11.817 and 11.848.*

11.819 Quantum Gravity
The course deals with gravitation as a quantum field, threshold properties of gravitational quantum S-matrix, quantization leading to a set of Feynman rules, calculations of simple tree diagrams, closed loop infinities and the problem of renormalizability of quantum gravity. *Prep. 11.818.*

11.857, 11.858, 11.859 Many-Body Theory A, B, C (4 q.h.)
Introduction to some many-body problems and the required mathematical techniques. Theory of linear response and correlation functions. Landau's theory of Fermi liquids and applications to solids. Theory of superconductivity and superfluidity. General theory of Green's functions and diagrammatic techniques. *Prep. 11.829, 11.843, 11.87B.* Offered every other year.

11.854, 11.855, 11.856 Fields, Particles, and Currents A, B, C (4 q.h.)
Introduction to a local field theory. Symmetries of the Lagrangian and conservation laws, Lorentz group, spin, and helicity. P, C, and T. Klein-Gordon, Dirac, vector meson and photon fields. The S-matrix and LSZ reduction formulae. Spectral representations. Feynman diagrams. Green's functions at large Euclidean momenta. Renormalization and finiteness. The renormalization group and asymptotic freedom. Gauge theories, spontaneous breaking and Higgs phenomenon. Weinberg's unified theory of weak and electromagnetic interactions. Currents. *Prep. 11.848.*

11.837 Electromagnetic Theory D (3 q.h.)
Advanced topics in electromagnetic theory such as problems involving radiation reaction, energy, momentum, and the equations of motion of a high-speed particle, Cerenkov radiation, the Lagrangian and Hamiltonian formulation of electromagnetism. *Prep. 11.836.*

11.838, 11.839 General Relativity A, B (3 q.h.)
A brief survey of differential geometry, physical basis of the Einstein equations, simple solutions and experimental tests, cosmology, asymptotic properties of the Einstein equations (radiation, energy, momentum), quantization of the theory. *Prep. 11.837 and 11.826.*

11.91A, B, C (1 q.h.)
11.92A, B, C (2 q.h.)
11.93A, B, C (3 q.h.)
11.94A, B, C (4 q.h.)
Reading course, or theoretical or experimental work under individual faculty supervision. *Prep. Consent of faculty member.*

11.995 Doctoral Dissertation
Experimental and theoretical work for Ph.D. candidates.

political science

Professors
Walter S. Jones, Ph.D.
Edward W. Brooke Professor
R. Gregg Wilfong, Ph.D.

Associate Professors
L. Gerald Bursey, Ph.D.
Robert L. Cord, Ph.D.
Robert E. Gilbert, Ph.D.
Minton F. Goldman, Ph.D.
David E. Schmitt, Ph.D., Acting Chairman
Steve Worth, Ph.D.

Assistant Professors
Seth I. Hirshorn, Ph.D.
Edward McD. Humberger, Ph.D.
Eileen McDonagh, Ph.D.
Suzanne Ogden, Ph.D.
Wendell C. Lawther, M.A.

Adjunct Faculty
Elizabeth D. Bennett, S.M., J.D.
Gordon Bowen, M.B.A.
Thomas J. Cahill, Ph.D.
Ernest W. Cook, Ph.D.
Oleta L. Crain, M.P.A.
Michael P. Curran, M.A., J.D.
Maxim M. Dem'chak, M.P.A.
Richard M. Doherty, M.A., J.D.
Kevin T. Fitzpatrick, M.B.A.
Etsie L. Foreman, M.A.
W. Arthur Gagne, Jr., S.B., M.B.A.
Richard Gladstone, M.A., M.C.P.
Harry Grossman, L.L.B.
James T. Hilliard, J.D.
Paul G. Keough, M.P.A.
Demeter J. Kollias, M.P.A.
Ronald E. Lawson, M.B.A., M.P.A.
Alexander MacMillan, J.D.
Robert H. McClain, Jr., M.P.A.
Harold J. Mezoff, M.P.A.
Walter W. Mode, M.P.A.
Richard B. Morrison, Ed.D.
Robert J. M. O'Hare, M.S.
Richard A. Siegel, Ph.D.
Marvin Siflinger, M.P.A.
Wallace Stickney, M.S.
Richard E. Wall, M.A.
John S. Warren, M.P.A.
John A. Wolaver, M.B.A., M.U.A.

Admission

In addition to the admission requirements listed on page 22, applicants for the Master of Arts program should have had a background which includes at least 15 semester hours of political science or government. All applicants must take the Graduate Record Examination.

Applicants for the Master of Public Administration program should demonstrate a clear and strong interest in public administration. All applicants for admission must furnish a statement that supports his or her interest in public administration and provides reasons for wishing to enter this program. Although it is anticipated that most candidates for this program will come with a major concentration in the social sciences, this is not mandatory, and applicants from other fields such as engineering, law, the sciences, and business administration will be considered for candidacy.

THE MASTER OF ARTS DEGREE

Program

Forty quarter hours of academic work are required including a four credit course in Scope and Method in Political Science, which should be completed at the outset of the program. With the approval of the faculty adviser, a maximum of nine quarter hours may be elected from graduate courses in other departments and a maximum of eight quarter hours may be elected from advanced undergraduate courses.

A thesis is optional with the approval of the chairman of the department. If approved, a thesis carries six quarter hours of credit.

Comprehensive Examination

This examination will be held in accordance with the general graduate school regulations. Every candidate for the degree must pass examinations in two fields as prescribed by the department. Degree candidates are limited to two attempts at successful examination in each field. Choice may be made from the following fields: American Government, Comparative Government, International Relations, Political Theory, or Public Administration.

THE MASTER OF PUBLIC ADMINISTRATION DEGREE

Program

Forty-two quarter hours of academic work are required. All students must complete the following five courses:

22.871 Public Budgeting, or
22.872 Public Fiscal Management
22.874 Functions and Techniques of Public Management
22.880 Survey of Public Administration
22.882 Public Personnel Administration
22.885 Quantitative Methods in Public Administration

At least five additional courses must be selected from courses designated public administration electives. Not more than four courses may be selected from other graduate courses offered by the department or the University, and these must have the approval of the faculty adviser.

M.P.A. Concentrations

Students may elect to declare an M.P.A. concentration after completing four courses. Concentration areas include: (1) Public Organization and Management, (2) Public Finance and Budgeting, (3) Public Personnel Administration, (4) State and Urban Administration, and (5) Policy Sciences. The concentrations seek to provide integrated course offerings in key public administration fields. Each concentration area is coordinated by a

full-time faculty member, who also serves as advisor to students in his or her area of concentration. For each concentration area students must take at least one required course and at least three of the concentration electives. They must also meet the above M.P.A. Program requirements.

Comprehensive Examination

A candidate for the degree must pass a general examination in the field of public administration as a whole which will test both mastery of the literature and the ability to apply concepts in the field to problems of government. Degree candidates are limited to two attempts at successful completion of the comprehensive examination. Candidates who have selected an M.P.A. concentration area will be expected to answer at least one question in their concentration area.

DESCRIPTION OF COURSES

All courses carry three quarter hours of credit unless otherwise specified.
All courses are seminars.

22.800 American Government
Analysis in depth of selected problems in American government. Examples of problems are: transition of American political parties, legislative reapportionments, and the decline of Congress as a law-making body. *M.P.A. elective.*

22.805 Scope and Methods of Political Science (4 q.h.)
This course is designed as an in-depth examination of the assumptions, principles, etc. that underlie contemporary political science. As such it invites the student to consider the present practice of the discipline in the light of its history and to critically evaluate the discipline in the interest of a greater understanding of nature and limits.

22.810 Models of Political Systems.
A detailed examination and critique of current models of political systems.

22.812 Political Psychology and Socialization
An examination of theories of political psychology, opinion formation and attitude change; of political ideology; of processes of individual political development and socialization; of effects on mass and elite political behavior; of attitudinal differences and differential socialization experiences; of individual political behavior and the political system.

22.815 Politics and the Mass Media
Study of the role of mass media in the formation of public opinion, with special attention to use of the media in the electoral process.

22.820 Legislative Process
Study of Congress and of the influence of the President, administrative bureaucracy, parties, interest groups, and public opinion on the development of legislative policy. Comparisons will be made with legislative process in the states. *M.P.A. elective.*

22.821 Theories of American Political Participation
This course will examine political behavior at both the national electorate level and at the level of legislative roll call voting, analyzing the relative impact of demographic and attitudinal components as well as the effect of constituency and partisan identification upon legislative behavior.

22.822 American Constitutional Law
Employing excerpts of U.S. Supreme Court decisions and other primary legal materials, this course examines the constitutional rationale for judicial review; various philosophical approaches to the exercise of judicial power; and the scope of judicial authority to settle questions challenging the legitimacy of governmental actions in the American constitutional system.

22.823 American Constitutional Law II
Using excerpts of primary legal materials, this course builds upon the judicial doctrines developed in 22.822 and specifically examines the constitutional theories behind the growth of congressional prerogatives in economic and social affairs, and expanding presidential power in internal and foreign matters. *Prep. 22.822 or consent of the instructor.*

22.824 The Presidency
Examination of the place and function of the chief executive in the formulation and execution of public policy. *M.P.A. elective.*

22.826 American Electoral Behavior
The theoretical and methodological assumptions of election studies of the American political system will be analyzed and the substantive conclusions carefully reviewed.

22.827 Campaigns and Elections.
A study of campaign tactics and strategies. Field work required.

22.828 The Judiciary
Analysis of the role of the judiciary in the American governmental process. Special attention is given to those areas of constitutional law where the Court's decisions have a profound impact on the basic structure of American politics (apportionment, economic regulation, federalism, etc.).

22.829 Political Parties, Pressure Groups and Public Policy
A study of the role of parties and pressure groups in the policy making process; trends in contemporary party politics will be examined as well as behavior patterns of the American electorate.

22.830 Civil Rights
Examination of the doctrine of constitutionalism illustrated and amplified by a study of the substance and process of the Bill of Rights as developed in decisions of Federal courts, and Congressional enactments.

22.831 Procedural Due Process
Utilizing excerpts from U.S. Supreme Court decisions and other legal materials, this course examines the philosophical and constitutional relationships between Amendments 4, 5, 6, 8 and the Fourteenth Amendment. The substance of the right to

fair trial, counsel, confrontation, protection against self-incrimination and unreasonable searches and seizures are among the many procedural rights examined through the decisions of the Roosevelt, Vinson, Warren, and Burger Courts.

22.832 Intergovernmental Relations
An institutional-behavioral analysis of the changing relationship between the various levels of American government — national, state, and local — relating the pattern of change to the social and economic forces which underlie it. *M.P.A. elective.*

22.834 Constitutional Law in Public Administration
An introduction to American Constitutional Law and the Federal system using case materials and emphasizing principles of importance to public administrators, including such constitutional concepts as separation of powers, judicial review, dual federalism, legislative investigating power, executive impoundment, federal preemption and the appointment and removal power. *M.P.A. elective.*

22.835 Administrative Problems in Criminal Justice
An examination of the criminal justice system in the United States with particular emphasis on political and administrative factors. Emphasis on the role of police, courts, judges, juries, parole, probation and incarceration. *M.P.A. elective.*

22.838 Administrative Ethics in Public Management
An analysis of ethical problems in American public administration including discussion of ethical dilemmas frequently faced by public managers. *M.P.A. elective.*

22.840 Problems in State Administration
Appraisal of the problems of contemporary state government in the U.S. Particular emphasis is given to the state government of Massachusetts. Individual research is stressed. *M.P.A. elective.*

22.841 Problems in Urban Planning
An exploration of the devices available to the urban planner for policy implementation, including zoning, subdivision regulation, and capital improvement programs. Special emphasis is given to the planning of individual sites. *M.P.A. elective.*

22.842 Techniques of Urban Planning
A study of the history and techniques of city planning, stressing the elements of planning. *M.P.A. elective.*

22.843 The Politics of Urban Planning
An investigation of the relationships of planning to other governmental functions with stress on practical processes, particularly at the municipal government level. *M.P.A. elective.*

22.844 Urban Administration
The contemporary crisis in urban government — problems of political independence, government finance and administration, rapid growth of suburban and metropolitan areas, and decline and decay of the core city are stressed. Particular emphasis is given to the Boston metropolitan area. Individual research is stressed. *M.P.A. elective.*

22.845 Problems of Urban Administration
Selected case problems and topics in municipal administration including organization, financial management, personnel and labor relations, municipal services, and public and political relations. Individual research is stressed. *M.P.A. elective.*

22.846 Problems of Regional Development
An examination of the role of government and politics in the planning, programming, and administration of regional and urban development in the United States. Consideration is given to urban renewal; interurban and interregional competition; interstate compacts; public authorities; T.V.A., Appalachia, and New England regional development; anti-poverty programs; and conflicts between public and private interests. Individual research is stressed. *M.P.A. elective.*

22.847 The Politics of Transportation
Examination of the role of politics, governmental mechanisms and public policy in the transportation planning process. Particular attention is given to political interest groups and the manner in which they affect transportation policy on the federal, state and local levels. *M.P.A. elective.*

22.848 Problems of Community Development
Examination of the role of government, politics and public policy in the urban process and related problems in the United States. *M.P.A. elective.*

22.850 Comparative Politics I
Comparative analysis of politics and political systems with special attention to fundamental problems of theory and practice. The chief focus is on contemporary political systems and contemporary theories in the field of comparative politics. Traditional models are also treated, but more briefly. Particular attention will be paid to British and American political experience.

22.851 Comparative Politics II
Extends and intensifies the comparative analysis of politics undertaken in Comparative Politics I by examining a broader range of institutional experience. Special attention will be given to European political experience, particularly that of France and Germany. *Prep. 22.850.*

22.852 European Political Parties
A comparative cross-national study of political organization and behavior in England, France, and Germany with emphasis on party leadership, strategy, organization and constituency as well as socialization, recruitment, and participation of voters.

22.853 Crisis Politics in Democracies and Dictatorships
Analysis of governmental response to crises and emergencies. Consideration of such topics as war powers, riots and rebellions, martial law, transfer of regime, succession problems, economic crises, presidential emergency powers, national security powers, executive privilege, impeachment, etc.

22.854 Totalitarianism
An analysis of totalitarianism and dictatorship including study of historical background; fundamental characteristics; theories of origin, nature, and significance;

and evaluation of techniques, ideologies, policies, and instruments of power. Special attention will be given to the government and politics of the Soviet Union.

22.855 Government and Politics in Germany
A study of political culture, federalism, and executive-legislative relations on the national level with a view to appraising the quality and durability of the present democratic system.

22.856 Government and Politics of France
A study of governmental organization and political behavior in France today. Special attention is given to the role of the presidency, executive-legislative relations, and the political party system.

22.857 European Legislative Systems
A comparative analysis of the legislatures in Britain, France, and Germany with emphasis on patterns of historical development, functions, internal organization and relations with the executive.

22.858 Government and Politics of the United Kingdom of Great Britain and Northern Ireland
An analysis of government organization and political behavior in the United Kingdom. Special attention will be given to executive-legislative relations, the political party system, and the politics of Northern Ireland.

22.859 European National Executives
A comparative cross-national study of executive decision making in England, France, and Germany with emphasis on varying patterns of presidential and cabinet authority as well as relationships with the legislature.

22.860 Collective Bargaining in the Public Sector
Study of the mechanisms for labor relations in federal, state and local government with its impact on the public manager. Emphasis is placed upon collective bargaining processes, tactics, and techniques. *M.P.A. elective.*

22.861 Grantsmanship
Instruction in ways to prepare well-conceived, adequately documented, and logically developed grant proposals. Consideration will also be given to the political strategies of proposal submission. *M.P.A. elective.*

22.863 Management Information Systems
The course studies the life cycle of a management system through its three phases: (1) study and design; (2) implementation; and (3) operation within the target organization. It will explore the impact which management information systems have and may in the future have on governmental managers, on their professional environment, and on the society which they serve. Various government MIS will be studied. The course requires no mathematical or data processing background. *M.P.A. elective.*

22.864 Problems in Computer Applications
Definition and study of the characteristic weaknesses and failures of information systems with use of case studies to examine problems in governmental computer

applications. Particular emphasis on management's role in minimizing or eliminating problems of system control, error detection, audit, security, hardware reliability and manufacturer support. *M.P.A. elective.*

22.865 Computer Techniques in Public Administration
A general orientation to the computer, its uses and operation, with particular attention to programming analysis, preparation and coding, and use of computer programs specifically written for governmental applications. *M.P.A. elective.*

22.867 Health Care Management
An exploration of concepts in managing health care systems with special emphasis on management as it relates to policy, organization, and development of health care programs and institutions. *M.P.A. elective.*

22.868 Politics of Health Care Administration
An examination of the politics and administration of health services delivery systems, including a discussion of current topics in health care administration and politics (e.g. national health insurance, health maintenance organizations, physician assistants, citizen participation, administrative decentralization), and an introduction to current developments in policy evaluation methodology and health services research. *M.P.A. elective.*

22.870 Public Budgeting and Fiscal Management
An overview of money management, budgeting, and allocation processes and problems in public organizations. *M.P.A. elective.*

22.871 Public Budgeting
Emphasizes the public budgeting function in its relationship to other functions of public administration. Business budgeting in contrast with public, conflicting legislative, and executive interests are examined; illustration is given of the budget cycle and the mechanics of budget preparation; attention is given to means for improving budget decision-making and administration with use of quantitative and other methods.

22.872 Public Fiscal Mangement
A study of the interrelationships in public administration between systems of finance and the achievement of program objectives. Emphasis is placed upon those aspects of the budgetary process that bear on fiscal policy and appropriations.

22.873 Systematic Analysis and Public Finance
A conceptual examination of the Planning, Programming and Budgeting System (PPBS) and its application to the decision-making and budgetary processes in the public sector. An overview of the elements of the system and their application in determining optimum allocation of public funds. Specific examples will be discussed. *M.P.A. elective.*

22.874 Functions and Techniques of Public Management
An introduction to problems in public management and techniques for dealing with them. This will include functions of middle management, supervision, administration of staff activities (e.g. planning, personnel, budget), organization and methods, public relations, managerial use of computer-based techniques, and tactics and strategies of management.

22.876 Administrative Behavior
An analysis of the sociological and psychological aspects of organization and management. Topics include: bureaucratic leadership; interaction of individual and organization; dynamics of the small group; pathology of bureaucratic behavior. *M.P.A. elective.*

22.877 Public Policy and Environmental Control
Consideration of the legal, political, administrative, and intergovernmental factors involved in the formulation of public policy and the exercise of public power in regulating the use of the environment. Individual research is stressed. *M.P.A. elective.*

22.879 Science, Technology, and the Administration of Public Policy
An analysis of central administrative and policy issues raised by the interrelationships of science and public affairs. Some issues to be discussed: effects of technological development upon the development of policy alternatives and their implementation; national policy for support of science and technology; the administrative role of the expert. *M.P.A. elective.*

22.880 Survey of Public Administration
Introduction to the literature and the major topics in public administration with special attention given to the interrelationships of politics and administration.

22.881 Special Issues in Public Personnel Administration
Selected issues and problems will be examined in depth. *Prep. 22.882. M.P.A. elective.*

22.882 Public Personnel Administration
Technique, practice, and organization of personnel functions in public administration, including recruitment, compensation, training, discipline, and relations with employee organizations. *M.P.A. elective.*

22.883 Comparative Public Administration
A comparative study of the approaches to public administration in selected democratic governments in the United States and Europe. *M.P.A. elective.*

22.885 Quantitative Methods in Public Administration
Application of statistical techniques to Public Administration. *M.P.A. elective.*

22.886 Advanced Quantitative Methods
Seminar instruction on either individual or small group projects emphasizing the application of methodology to administrative problem-solving. Specific topics vary quarter-to-quarter and are oriented toward the needs and interests of student participants. *M.P.A. elective.*

22.887 Regional Administration
An examination of the growth and development of intrastate and interstate regional councils, together with their relations with local, state, and federal governments. Examples throughout the nation will be studied, and a detailed analysis made of regional councils in Massachusetts. *M.P.A. elective.*

22.888 Federal Administrative Law
Study of rule-making, adjudication (formal and informal), administrative finality and judicial review, administrative procedure, scope of administrative powers, and enforcement techniques. *M.P.A. elective.*

22.889 Governmental Accounting
Examination of principles and procedures involved in governmental accounting. *M.P.A. elective.*

22.890 Research Seminar in Public Administration
Will require each student to develop and report upon an individual research project in public administration. This seminar will normally be taken in the last quarter of study for the M.P.A. degree. *M.P.A. elective.*

22.891 Public Administration and Economic Impacts
An analysis of the impact of economic variables on the administrative process. Special attention will be given to the administrative problems posed by inflation and recession. *M.P.A. elective.*

22.892 Techniques of Policy Analysis
The purpose of this course is to familiarize the student with various techniques useful in analyzing public policy issues. Case studies of specific applications of such methods as modeling, simulation, and survey research will be examined. *M.P.A. elective.*

22.893 Productivity and Public Policy
The purpose of Productivity and Public Policy is to familiarize the student with public sector productivity analysis. Studies employing productivity measures, primarily dealing with urban and federal levels of government, will be discussed. The final few weeks of the course will focus on uses of productivity measures, especially personnel and program evaluation. As part of the course requirements, students will design a productivity study for a federal, state or city agency. *M.P.A. elective.*

22.894 Techniques of Program Evaluation
A review of the various methods used to assess public policy including identification and categorization of outcome, input and program operation variables; and the types of research designs and the steps needed to institute program change after completion of an evaluation study. *M.P.A. elective.*

22.895 Motivation and Management
An examination of current sociological and psychological theories on the subject of motivations of individuals in organizations and of the effects of their application. *M.P.A. elective.*

22.896 Management Planning for Public Organizations
A review of the growth of the planning approach to public management and of its application in specific agencies. Topics include organization of the management planning function, budget planning and methods of providing planning forecasts. *M.P.A. elective.*

22.897 Management by Objectives
A course designed to provide a basic understanding of MBO and to prepare the stu-

dent to prepare, develop and implement an MBO System in a public agency. Topics will include objective setting and resource allocation, organizational development, work planning and control. *MPA elective.*

22.898 Organizational Psychology and Behavior
The primary objective is to familiarize the student with the literature, theories and concepts of administrative behavior as it has evolved, and then to focus on the development of self-awareness and the building of interpersonal skills. *M.P.A. elective.*

22.899 Public Issues in Human Resources
Discussion of the origins and development of the Social Security Public Assistance Income Maintenance and various health care programs. The course content will focus on controversial public policy issues of retirement, survivors, disability insurance, aid to families with dependent children, medicare and medicaid. The objective of the course is to develop understanding of the push and pull of many different viewpoints involved in public policy development. *M.P.A. elective.*

22.900 Ancient and Medieval Political Thought
The development of political thought from Greek antiquity to the end of the Middle Ages. Both historical and analytical approaches will be utilized. Attention is also paid to the cultural, social, and intellectual context within which political theories develop.

22.905 Affirmative Action
An analysis of the impact of affirmative action programs on public personnel administration. Topics include the Equal Employment Opportunity Act of 1972 and subsequent executive orders; commencement and maintenance of affirmative action programs; and the use of affirmative action to improve personnel functions. *M.P.A. elective.*

22.906 Position Classification
An examination of the bases of position classification at the state, federal and local levels. After reviewing the process of job analysis the course will emphasize several classification schemes, including the new Federal factor benchmark system. Final topics will include wage and salary administration. *M.P.A. elective*

22.907 Recruitment and Selection
A study of the bases of recruitment and selection including the use of manpower planning and the use of testing. *M.P.A. elective*

22.909 State and Regional Planning
A course designed to familiarize students with the comprehensive planning of state services, including the development of program objectives, alternative implementation strategies and their evaluation. *M.P.A. elective.*

22.910 Modern Political Thought
Examination of political thought from Machiavelli to Marx.

22.911 Energy Development and Conservation
A non-technical review of the energy problems of the United States in general and the New England region in particular. All potential sources of energy are explored as

well as the need for continuous increases in the energy supply and the potential for energy conservation. Comparative analyses are presented to provide a basis for action to those who must participate in energy-related decision making. *M.P.A. elective.*

22.920 Contemporary Political Theory
The main currents of political thought in the latter half of the nineteenth and the twentieth centuries with special emphasis on the relations between political theory, philosophy, and political science.

22.922 The Measurement of Political Events
The purpose of this course is to acquaint political science majors with some analytical and mathematical tools appropriate for use in studying politics.

22.924 Strategy in Politics
An examination of formal theories of political behavior, stressing elements of strategy and their implications. Relationships between political actors, patterns in political processes, bargaining, decision making, and voting will be covered.

22.926 Trends in American Political Thought
Examination of intellectual concepts and movements that have informed and influenced American political life with emphasis upon those relating to the making and execution of public policy. *M.P.A. elective.*

22.927 Organizational Development
An examination of Organizational Development as a management technique designed to increase organizational effectiveness by emphasizing the personal growth of employees. Specific topics include intergroup and interpersonal cooperation, resolving intergroup conflict, team management, and planned organizational change. *M.P.A. elective.*

22.928 Organization Theory
An in-depth study of the major organization theories including the scientific basis for organization theory; models and ideal types; decision-making; application of game theory; systems analysis. *M.P.A. elective.*

22.929 Organizational Analysis and Change
A study of the structure and processes of organization essential for problem-solving and for effecting organizational change. Emphasis is placed upon the application of social science theory and administrative principles in administrative problem identification and problem resolution. *M.P.A. elective.*

22.930 Positive Political Theory
An examination of the works of Anthony Downs, William Riker, and others in this current school of political analysis.

22.931 Environment and Energy
An analysis of environment and energy problems facing the American administrative system. The interrelationships of environment and energy policy will be discussed. Special attention will be given to new administrative requirements placed on administrators in government agencies not directly connected with environmental and energy affairs. *M.P.A. elective.*

22.932 State Finance and Budgeting
This course explores the many channels that the state budget must travel before it becomes a viable document. The several ways by which the budget can be affected before and after it is signed into law will be explored in depth. *M.P.A. elective.*

22.933 Revenue Sources for Local Government and Public Organizations
Selected sources of revenue, other than local taxes, will be studied from administrative and political perspectives. Case studies will be used to analyze real and in-kind revenue sources such as: philanthropy, concessions, fees for service, volunteerism, resource recovery and multi-town consortia for public services. *M.P.A. elective.*

22.935 Urban Planning Workshop I
The course is intended to enable the student to experience the actual decision making that goes into the formulation of local communities' comprehensive plans. A knowledge of the material covered in course 22.842. Techniques of Urban Planning is a prerequisite. *M.P.A. elective.*

22.936 Urban Planning Workshop II
Continuation of Urban Planning Workshop I. *M.P.A. elective.*

22.937 Forms of Municipal Government
After a review of the powers and functions of municipal government, this course will undertake an in-depth examination and analysis of the several forms of organizations employed by municipal governments in the U.S. (mayor-council, commission, council-manager, and town meeting). Examination will be made of various subcategories within these broad areas, e.g., strong mayor, weak mayor, council-at-large, council from districts, open town meeting, representative town meeting, town manager, and executive secretary. *M.P.A. elective.*

22.938 Municipal Finance and Budgeting
A discussion of the special problems of budgeting and finance in local governments, including budget preparation and presentation, debt management, capital financing and local taxation policy. *M.P.A. elective.*

22.939 Municipal Law
Designed for the non-lawyer, this course will review the law of municipal corporations. Topics will include general powers and duties, charters, ordinances, administrative rules and regulations, officers and employees, tort liability, policy powers, planning and zoning, taxation and borrowing, elections, licenses and permits. *M.P.A. elective.*

22.940 Comparative Urban Administration
This course will analyze decision-making structures and processes in selected urban areas. Topics will include: examination of world organization trends and implications for administration and politics of cities; changing scopes, scale, participants, and organization of urban politics; and selected issues such as urban housing, finance, leadership, planning and goals. *M.P.A. elective.*

22.942 Asia and the Politics of Development
This course relates the theoretical literature on political development to the concrete

attempts to develop in Asia. Because of the diversity in levels and types of political development in Asian states, each student is encouraged to concentrate on one state and explore different ideas about political development within the context of that state.

22.943 The Governments and Politics of Latin America
This course investigates contemporary Latin American politics with particular emphasis on militarism, revolution, executive dominance, and social change. It then focuses on three representative nations such as Mexico, Argentina, and Cuba.

22.944 Nationalism
The evolution and role of nationalism in both theory and practice. Representative nationalistic movements and theories are analyzed.

22.946 The Politics of Revolution and Change
Analysis of the nature of political change with attention to both theory and practice. Topics discussed are revolution, major trends in contemporary politics, and the relationship between political change and technological, scientific, or social change.

22.948 Government and Politics of North Africa and the Middle East
Comparative analysis of the political systems and foreign policies of African states north of the Sahara. Also stressed is the relationship of this area with the Middle East.

22.950 United States-Soviet Relations
The relations between the United States and the Soviet Union from 1917 to the present. Topics stressed are: the "nonrecognition" period, the breakdown of the World War II "Grand Alliance," and the nature of the present power conflict.

22.951 United States-Far Eastern Relations
American diplomacy in the Far East, with primary concentration on Japan since World War II, the two Chinas, and Southeast Asia.

22.952 Communist China's Foreign Policy
A study of the Peking government's relations with Afro-Asia, the Soviet orbit, and the West. Attention is given to policy objectives, strategy, tactics, and the method of decision making in both the party and state apparatus.

22.954 Soviet Relations with Eastern Europe
An analysis of Soviet policy in Eastern Europe, especially Russian efforts after World War II to develop communism and maintain a position of pre-eminence in this region.

22.955 Chinese Politics
This course concentrates on the objectives of the Chinese revolution from 1911 to the present. It examines the political theory and institutions which have been established to promote "permanent revolution" and evaluates the "rationality" of Chinese Communist policies in terms of Chinese goals.

22.956 Government and Politics in Sub-Saharan Africa
Comparative analysis of the political systems and foreign policies of selected African states south of the Sahara. Special attention is given to the Republic of South Africa and its policy of apartheid.

22.958 Decision-Making in U.S. Foreign Policy
Comprehensive analysis of the governmental mechanism and process for decision-making in U.S. Foreign Policy. Case studies in decision-making will be emphasized.

22.959 American Foreign Policy
Examination in depth of selected issues concerning the role of the United States in world affairs since 1945.

22.960 Problems of World Order I
Emphasizes such topics as appraisal of diverse systems of public order, approaches of international law and international organization to the problem of world order, and the problem of world peace enforcement.

22.961 Problems of World Order II
Political problems of world order are stressed. Representative topics are arms control and disarmament, limits of economic growth, global interdependence, overpopulation, and adequate global food distribution.

22.964 The United Nations
Selected topics on the "non-political" work of the United Nations: human rights; economic, social, health and related problems; decolonization and the trusteeship system.

22.965 International Peace-Keeping
A detailed investigation of the origins, history and theory of interventionary peace-keeping, with reference to the documentation of the United Nations. An assessment of this method of maintaining regional stability, and a projection of potential methods of developing the method to broader applicability.

22.966 International Law
Examination of selected topics in International Law not covered in 22.960 and 22.961.

22.967 Regional Organization
A study of international organization at the regional level, concerned with examining the capability of institutions to foster integration of policy and authority, and with the effect of this progress upon broader international cooperation.

22.968 The Atlantic Community
A topical analysis of European-American diplomacy with particular stress upon security and economic matters. Major consideration of the integration of Europe, American responses, and the results of these interactions for world political and economic stability.

22.969 The United States and the United Nations
A study of the pursuit of American foreign policy through the organs of the United Nations, with emphasis on the uses and effects of parliamentary diplomacy. Examination of the reasons for reversal of American attitudes toward the United Nations as the world moves toward multipolarity. Particular stress upon economic matters and the American role in the UN's quest for a New International Economic Order.

22.980 Project Management
A workshop course aimed at the development of practical skills in managing one-time projects. Use of case method to discuss techniques of problem identification, establishment of objectives, pre-entry strategies, data collection, project planning and control, project presentation and the image of temporary projects. *M.P.A. elective.*

22.990 Assigned Reading (maximum: 6 q.h.)
Assigned reading under supervision of a faculty member.

22.991 Thesis (6 q.h.)
Thesis supervision by individual members of the department.

22.994 Seminar in Public Organization and Management
Analysis of specified topics and issues in Public Organization and Management. Purpose of the course is to provide flexibility in presenting material of current interest and to allow in-depth research into specified areas where appropriate. Subject matter to be covered will be covered in registration materials. *M.P.A. elective.*

22.995 Seminar in Public Finance and Budgeting
Analysis of specified topics and issues in Public Finance and Budgeting. Purpose of the course is to provide flexibility in presenting material of current interest and to allow in-depth research into specified areas where appropriate. Subject matter to be covered will be published in registration materials. *M.P.A. elective.*

22.996 Seminar in Public Personnel Administration
Analysis of specified topics and issues in Public Personnel Administration. Purpose of the course is to provide flexibility in presenting material of current interest and to allow in-depth research into specified areas where appropriate. Subject matter to be covered will be published in registration materials. *M.P.A. elective.*

22.997 Seminar in Policy Sciences
Analysis of specified topics and issues in the Policy Sciences. Purpose of the course is to provide flexibility in presenting material of current interest and to allow in-depth research into specified areas. Subject matter to be covered will be published in registration materials. *M.P.A. elective.*

22.998 Seminar in State and Urban Administration
Analysis of specified topics and issues in State and Urban Administration. Purpose of the course is to provide flexibility in presenting material of current interest and to allow in-depth research into specified areas where appropriate. Subject matter to be covered will be published in registration materials. *M.P.A. elective.*

psychology

Professors
John C. Armington, Ph.D.
Harlan Lane, Ph.D., Doc. ès Lettres
Chairman
Helen Mahut, Ph.D.
Bertram Scharf, Ph.D.
Murray Sidman, Ph.D.
Harold S. Zamansky, Ph.D.

Associate Professors
Edward A. Arees, Ph.D.
Roger F. Brightbill, Ph.D.
Perrin S. Cohen, Ph.D.
Charles Karis, Ph.D.
Harry A. Mackay, Ph.D.
Alexander A. Skavenski, Ph.D.
Lawrence T. Stoddard, Ph.D.
Michael Terman, Ph.D.

Assistant Professors
Martin Block, Ph.D.
Karen Busby, Ph.D.
Francois Grosjean, Ph.D.
Joanne L. Miller, Ph.D.
Claude Sigel, Ph.D.

Research Associates
Leila R. Cohen, Ph.D.
Jiuan S. Terman, Ph.D.
Stuart M. Zola, Ph.D.

THE PROGRAM OF GRADUATE STUDIES

The Department of Psychology offers a full-time program of graduate studies and research in experimental psychology leading to the Ph.D. degree. Applicants are considered only for the doctoral program; the M.A. is granted in the course of progress toward the Ph.D. Since the Ph.D. degree is awarded in experimental psychology, research accomplishment forms an essential and integral part of the doctoral program; students may expect to collaborate with faculty in conducting research in one or more of the following areas: learning and behavioral analysis; sensation and perception; neuropsychology; language and cognition; personality and social psychology.

Desirable experience includes laboratory courses in psychology and allied sciences as well as courses in mathematics. Applications should be filed by March 1, complete with official transcripts, three letters of recommendation, and scores on the Graduate Record Examination and the Miller Analogies Test.

Research assistantships and teaching assistantships carry a stipend of $3,000 for the first year, $3,000 for the second year, and $3,300 for the third year, with remission of tuition. In addition, some positions are available in research and teaching during the summer. The department aims to support all graduate students requesting financial aid.

The first year of the graduate program is uniform for all students. It includes a proseminar in experimental psychology, a course in quantitative methods, and a seminar in instrumentation. In addition, all students choose

a research advisor and take an active part in one of the current research projects. Detailed descriptions of the current research projects are contained in the brochure, "Research in Psychology at Northeastern," available on request.

At the end of the academic year, each student's readiness for the doctoral program is determined on the basis of her or his performance in the two seminars and a written examination in the quantitative methods course. Equal emphasis is placed on the quality of laboratory research during the first year.

After that year, the structure of the doctoral program is very flexible and assumes that the process of learning and scientific discovery must be individualized. A wide variety of advanced seminars and courses is offered. Colloquia and in-house seminars bring students and faculty together to discuss ongoing research, often with visiting scholars from other institutions. Most important, students pursue their research projects under the expert guidance of their advisors. The advisors and projects available to students vary from year to year. Potential applicants are encouraged to visit the department in order to discuss their interests with the faculty and to observe the program and facilities first-hand.

DESCRIPTION OF COURSES

All courses carry three quarter hours of credit unless otherwise specified.

19.817, 19.818, 19.819 General Experimental Psychology I, II, III (4 q.h.)
The Departmental proseminar. Student presentations and discussions of the experimental literature in the following areas: learning and behavioral analysis; sensation and perception; neuropsychology; language and cognition; personality and social psychology.

19.808, 19.809, 19.810 Quantitative Methods I, II, III
A survey of the quantitative methods used in experimental psychology, emphasizing applications of computer programming, theory of functions and relations, curve fitting, probability functions, set theory and analysis of variance.

19.980, 19.981, 19.982 Research Methods I, II, III (2 q.h.)
Instrumentation and laboratory techniques through instruction and participation in ongoing laboratory projects.

LEARNING AND BEHAVIORAL ANALYSIS

19.811, 19.812, 19.813 Programmed Learning Seminars I, II, III
Students learn to evaluate instructional programs in the light of basic behavioral principles, and become acquainted with programming techniques in the normal classroom, special education classroom, in complex academic subject matter, and in individual problem areas. Students design, test, and evaluate instructional programs for teaching specific subject matter material, or for application to remedial problems, and to test basic instructional theory.

19.820 Mental Retardation Seminar
Interdisciplinary seminar in mental retardation. Faculty members from various Boston universities present lectures and direct discussion in their specialty areas. A broad range of topics within retardation is covered including genetic factors, administrative issues in federal, state, and local programs, impact of communication problems for the mentally retarded individual, and other related topics.

19.821 Behavior Change in Institutions
A review of successful projects which have been carried out to provide effective remediation in institutions for the mentally ill, the mentally retarded, the juvenile delinquent, and the developing human (in schools).

19.835, 19.836, 19.837 Advanced Learning Seminars I, II, III
These seminars cover contemporary research in operant conditioning, with emphasis on relating the techniques of behavioral analysis to problems of reinforcement, comparative psychophysics, and physiological psychology.

19.912 Behavior Modification
Survey and demonstrations of applied behavior analysis, with emphasis on behavior therapies, retardate training techniques, and classroom behavior modification.

SENSATION AND PERCEPTION

19.828 Contemporary Psychophysics

19.830 Psychoacoustics
This seminar deals with the relationship between sound and auditory perception. After five tutorial sessions on the physics and laboratory generation of sound, thresholds, masking, loudness, pitch, and sound localization, students will lead discussions based on research papers in the psychoacoustic literature.

19.833 Perception
A detailed consideration of research in such areas as form, space, and pattern perception, recognition, and the effects of set and motivation on perception. Physiological concomitants of perceptual phenomena will be considered.

19.860, 19.861, 19.862 Vision I, II, III
Seminars: classical and modern problems in vision. Recent journal articles will provide primary source materials for discussion. Consideration will be given to problems of stimulus specification, retinal structure, photochemistry, and psychophysical measures of sensitivity, color vision, and electrophysiology.

NEUROPSYCHOLOGY

19.880, 19.881 Sensory Psychophysiology I, II
Concentration on the anatomy and physiology of the various sensory systems, and correlation of these data with psychophysical and perceptual concepts. Laboratory work will be included.

19.844, 19.845, 19.846 Physiological and Comparative Psychology I, II, III
Seminars: a shared background, key concepts, and central issues of the field of physiological and comparative psychology.

19.915 Biological Bases of Mental Retardation
The course considers the relationship between biological malfunction, of the brain in particular, and the defective learning ability and other behavioral abnormalities which constitute mental retardation. The aim is toward as comprehensive a survey as time permits. Exercises include actual case presentations as illustrative examples.

19.919 Neurochemistry and Behavior
This seminar will examine different experimental approaches to the problems involved in uncovering the relationships between changes in brain activity and changes in behavior produced by drugs. Discussions will center on current theorizing on the role of early experience, environmental factors, biological rhythms, and other facets in the determination of drug-induced behavioral changes.

19.952, 19.953 Neurological and Sensory Impairments Seminars I, II
Etiology, assessment, and diagnosis, clinical characteristics, and education of the mentally retarded with visual, hearing, and motor deficits are studied. In addition to discussion participation, experiences are provided in evaluation and remedial programming, via application of operant techniques.

LANGUAGE AND COGNITION

19.870 Psycholinguistics
Seminar. In depth analysis of research methods and findings in selected problems in the psychology of language, including developmental, anthropological, and experimental psycholinguistics.

19.871 Psycholinguistics Laboratory
Students perform modified replications of classical experiments in several areas of psycholinguistics and conduct and report a psycholinguistic study of their own design.

PERSONALITY AND SOCIAL PSYCHOLOGY

19.822 Psychopathology
A detailed consideration of the major forms of psychopathology, including the neuroses (obsessional states, hysteria, anxiety states, phobias), the psychoses (schizophrenia, mania, depression, paranoia), psychosomatics, sociopathy, conduct disorders, organic disorders, and mental retardation.

19.901, 19.902, 19.903 Personality Theory and Research I, II, III
A survey of representative theoretical formulations of the normal personality and its development, and an examination of experimental evidence bearing upon relevant concepts and assumptions (anxiety, repression, aggression, cognitive styles).

SPECIAL TOPICS

19.807 Advanced Quantitative Methods and Instrumentation

19.990 Special Topics in Psychology (maximum: (9 q.h.)

19.991 Thesis (6 q.h.)
Experimental work for the master's degree requirement.

19.995 Dissertation (0 q.h.)
Experimental and theoretical work for Ph.D. candidates.

sociology and anthropology

Professors
Morris Freilich, Ph.D.
Blanche Geer, Ph.D.
Frank F. Lee, Ph.D.
Morton Rubin, Ph.D.
Earl Rubington, Ph.D.

Associate Professors
Patricia Golden,
Ph.D., Acting Chairperson
Elliott A. Krause, Ph.D.
Lila Leibowitz, Ph.D.
Jack Levin, Ph.D.

Adjunct Faculty
Paul Dredge
William Greenbaum
Joan Laxson, Ph.D.

Assistant Professors
Richard Bourne, Ph.D.
Marcia Garrett, Ph.D.
Freddye Hill, Ph.D.
Wilfred Holton, Ph.D.
Deborah Kaufman, Ph.D.
Carol A. Owen, Ph.D.
Alex Rysman, Ph.D.

Admission

The general procedures and requirements are set forth on page 22. Students will normally be admitted to begin their graduate work in the Fall Quarter only. Applications received after March 15 will usually not be considered. Each application will be reviewed on its own merits. Any questions concerning the adequacy of the undergraduate background in sociology or anthropology will be considered individually. In some cases, students may be asked to make up certain deficiencies before proceeding to the basic requirements. Exceptions will be made with respect to procedural or substantive requirements on an individual basis if the circumstances seem sufficiently compelling.

In addition to examining the catalog and course offerings, all prospective candidates are urged to learn something about the scholarly interests and writings of our faculty and to talk with graduate students now in residence to ascertain whether or not we have something to offer in terms of their capabilities, needs, and interests.

***NB.* Some of the requirements listed below for both the M.A. and Ph.D. will undoubtedly have been modified. Please check with the department and/or the graduate school for the most recent information. This applies also to course offerings.**

THE MASTER'S DEGREE

The department offers graduate programs that lead to a master of arts degree in sociology or social anthropology. Forty-two quarter hours of B or better academic work are required for the degree. Certain advanced un-

dergraduate courses offered by the department may be taken for graduate credit with the approval of the department. Students must maintain a better than B average.

In general, students are encouraged to fashion a program of studies best suited to their needs and capabilities instead of following any single set of rigid requirements. To this end, all entering students should consult with the faculty adviser assigned to them, and other faculty members if possible, before registering for courses.

For the Master of Arts in Sociology, students are generally required to take two quarter courses in theory (usually 21.805, and 21.806) and two in methodology (usually 21.810 and either 21.811 or 21.916). The statistics requirement may be satisfied by achieving at least a B in 21.813 or its equivalent. All students are strongly advised to take some work in social anthropology.

For the Master of Arts in Sociology with an emphasis in Social Anthropology, students are generally required to take two quarter courses in theory (usually 20.805 and 20.802) and methodology. Other requirements will be individually determined. All students are strongly advised to take some work in sociology.

Students who can demonstrate proficiency in any of the requirements need not take those particular courses, and should petition the graduate committee for an opportunity to demonstrate proficiency.

A master's paper is required and earns four quarter hours of credit. This paper may be based on empirical or library research, and must be of publishable quality. It is expected that the full-time student will complete his master's paper no later than the end of his second year. Students planning to go on for the Ph.D. are urged to take the qualifying examination during their second year of residence as the results will be a major determining factor in deciding whether to encourage the student to try to go on or not.

Deadlines for Submission of Master's Paper

A student must have substantially finished his master's paper as certified by his first reader on or before April 1 of the year in which he expects to be awarded the degree. Those who miss the April 1st deadline will normally have to wait until the subsequent fall quarter, and should not expect that a defense can be set up much before November 1st of that quarter.

THE DOCTOR OF PHILOSOPHY DEGREE

The department offers the Ph.D. in sociology. A limited number of students will be enrolled in the Ph.D. program so as to provide highly personalized study and research training with individual supervision.

Admission

Applicants to the doctoral program should apply for admission not later than March fifteenth of the year in which they expect to complete the requirements for the master's degree.

Students seeking admission whose master's degree is not in sociology will be considered on an individual basis. A tentative evaluation of the probability of advanced standing will be made at the time the student is admitted with the final determination after the qualifying examination has been completed.

Students completing their master's at Northeastern will be considered for admission to the doctoral program only after the results of their qualifying examination have been evaluated. Students completing their master's at another institution are admitted with the expectation that they will take the qualifying examination at the first available opportunity.

Residence Requirement

The University's residence requirement can be satisfied by one year of full-time graduate work, or its equivalent, beyond the Master of Arts degree. If the M.A. has not been in sociology, a longer period of residence will undoubtedly be essential. Most students should expect to spend approximately two years or the equivalent in full-time graduate study beyond the requirements of the master's degree.

Degree Candidacy

Degree candidacy is established in accordance with the general regulations of the graduate school.

Qualifying Examination

Students will be examined on their ability to interpret readings and experience sociologically. A written examination is followed by an oral hearing where a) the strengths and weaknesses shown by the examination are discussed with the student and suggestions are made for remedying the weaknesses and b) in the light of these results a future course is charted for the student. The main purpose of this examination is diagnostic and should help both the department and the student to determine the best course of future action. Excessive weaknesses will lead to a recommendation to consider pursuing alternatives elsewhere.

Course Requirements

Generally, thirty-three hours of academic work beyond the master's degree are required. However, the actual number needed by any particular student will be specially determined in each case. Depending on background, experience, and performance, a greater or lesser number of formal courses may be required. Decisions on special cases will be made by the Committee on Graduate Studies (COGS), acting in conjunction with the student, his adviser, and the chairman of the department. Students entering from another university may be required to take certain basic courses before proceeding with the doctoral program.

Language Requirements

A reading knowledge of one language in which there is substantial sociological literature is required. Students must submit their choice to the COGS for approval. The language requirement must be satisfied before admission to the comprehensive examination. Statistics and/or advanced mathematics as well as languages needed primarily for field research are considered an integral part of the training of students specializing in such directions, and are therefore not the equivalent of the general language requirement.

Comprehensive Examination

During the period of doctoral degree candidacy, each student must pass a comprehensive examination, the purpose of which is to ensure that the student has breadth in sociology in areas other than that pursued in the dissertation. Two "state of the art" papers are required in fields which are not close to that represented by the dissertation. When a student feels ready to undertake these papers, s/he must submit the choice of fields to the COGS for approval.

A student who wants to demonstrate breadth in sociology in another way must petition the COGS. The comprehensive examination must be passed at least nine months before the commencement at which the Ph.D. is to be awarded.

Doctoral Dissertation

The student must submit a prospectus describing the topic of his doctoral dissertation, the methods of research, and the theoretical relevance of his problem. This prospectus is to be discussed with and approved by the dissertation committee consisting of the major adviser, two readers within the department and at least one reader from outside the department. The revised prospectus is then filed with the department.

Deadlines for Considering a Doctoral Dissertation

The chairman of the dissertation committee should be fully satisfied that a dissertation is substantially complete on or before April 1 of the year in which the candidate expects to defend.

Final Oral Examination

The dissertation will be defended after completion of all other requirements for the doctoral degree. This oral defense will be held approximately four weeks after the dissertation has been accepted by the dissertation committee, and at least two weeks before the commencement at which the degree is to be awarded.

NB. **Some of the requirements listed above for both the M.A. and Ph.D. will undoubtedly have been modified. Please check with the department and/or the graduate school for the most recent information. This applies also to course offerings.**

DESCRIPTION OF COURSES

All courses carry three quarter hours of credit unless otherwise specified.

SOCIAL ANTHROPOLOGY

Many undergraduate courses in the 20.200 series may be offered for graduate credit. Students should check the current course announcements to take advantage of these offerings.

20.802 Theory (4 q.h.)
History of major contemporary orientations: evolutionary approaches, culture area, cultural ecology, functionalism, structuralism, and analysis of current status of these and related theories.

20.809 Human Origins
An examination of the data on fossil remains and on contemporary primates which are essential for understanding human physical and behavioral evolution.

20.815 Tribal Societies and Culture
The structures and institutions of bands, tribes, and chiefdoms: comparative and functional studies of tribal societies and the dynamics of change under contact situations.

20.820 Peasant Society and Culture
Institutions of peasant society. The structure of traditional civilizations and the interrelations between urban and local communities: comparative and functional analysis of the peasant community and the dynamics of change from peasant to post-peasant and industralized societies.

20.825 Language and Communication
Human communication, including language. Theories of the evolution of language and the application of models derived from the study of language to other aspects of behavior.

20.828 Aggression
Concepts of aggression as they have been used in evolutionary and comparative anthropological formulations. Professional and popular publications in anthropology, ethology, and psychology are analyzed.

20.830 Individual and Culture
Examination of current theory and method in the study of the interplay between personality and culture. Contributions by various disciplines are discussed.

20.835 Kinship and Social Structure
A variety of kinship systems and their terminological and structural components and the way in which their systems articulate with other social institutions.

20.836 Family in Evolutionary Perspective
The emergence of family from pre-human patterns, its biological and behavioral components, and its cross-cultural variations examined from an evolutionary perspective.

20.840 Urban Anthropology
Selected problems in anthropological studies in urban societies.

20.850 Religion and Myth
Nature and institutionalization of primitive, ancient, and contemporary religions. Exploration of religious concepts and movements in relation to social, religious, and political organization.

20.860 Cultural Ecology
Examines man's adaptation to environment and the effect of different human adaptations on natural systems.

20.870 Evolution of Society
The development of political and economic institutions: specialization, social stratification and the emergence of civilization.

20.880, 20.881, 20.882, 20.883, 20.884, 20.885
Ethnographic area courses (India, Africa, Mediterranean and others) will be offered as resources permit.

20.950, 20.951, 20.952 Directed Study in Social Anthropology (maximum: 9 q.h.)
Reading and empirical research in social and cultural anthropology supervised by members of the anthropological staff.

20.980 Contemporary Issues in Social Anthropology
Contemporary issues in the field of anthropology. Supervised readings and written reports on special problems.

20.990 Seminar (maximum: 9 q.h.)
Discussion of selected topics in the field of anthropology.

20.991 Master's Paper in Sociology with an Emphasis in Social Anthropology (4 q.h.)
Empirical or library research meeting the criteria for publication in a professional journal. *Supervision by members of the department.*

SOCIOLOGY

21.805, 21.806 Foundations of Social Theory I and II (4 q.h. each quarter)
The classic theorists (Durkheim, Weber, Marx, Simmel, and others) will be considered intensively.

21.807 Contemporary Sociological Theories
Analytic treatment of major contemporary theories such as functionalism, conflict, neo-Marxism, and others. *Prep. 21.806.*

21.808 Recent Developments in Sociological Theory
New horizons in theory and the relation of theory to research. Topics to be selected each year and announced by the instructor.

21.810 Introduction to Research Methods I (4 q.h.)
A survey of methods of social research including field study and participant observation techniques, survey techniques, interviewing and questionnaire construction, sampling procedures, experimental design, content analysis and use of available data.

21.811 Introduction to Research Methods II (4 q.h.)
Quantitative techniques of analysis. Students will conduct individual research projects.

21.812 Current Issues in Social Research
Selected topics will be examined.

21.813 Statistical Methods for Sociologists (4 q.h.)
This course is a detailed introduction to statistical methods most relevant to sociology. Topics include tabular analysis, non-parametric statistics, analysis of variance, regression analysis, path analysis, measures of association, estimation and univariate and multivariate hypothesis testing. The approach will presume a knowledge of elementary statistical theory.

21.814 Mathematical Models and Advanced Statistical Methods for Sociologists
This course will include selected topics in advanced sociological statistics: introduction to Markov chains, factor analysis, multiple classification analysis, and model building. The orientation will be toward the more advanced students and the approach will be somewhat mathematical. Some mathematical aptitude or at least one previous college course in mathematics is suggested. Graduate statistics (21.813) is a prerequisite.

21.817 American Society
Study of the development of and the changes in the institutional structure of American society in comparison with certain other social systems.

21.820 Sociology of Deviant Behavior
Applications of sociological concepts and principles to some problems of social disorganization in industrial societies. Analysis of such problems as suicide, prostitution, physical handicaps, unemployment, alcoholism, sexual deviance, and gambling. *Prep. 21.806.*

21.822 Sociology of Poverty
An analysis of sociological perspectives on causes of poverty, public views on poverty and institutional responses to poverty. A concern with policy issues and implementation of policies is emphasized. For advanced students in the social sciences and in the various human service schools of the university.

21.827 Sociology of Delinquency
Social and psychological factors of delinquency and their implications for prevention, rehabilitation, and treatment.

21.832 Sociology of Crime and Justice
A sociological and legal analysis of the criminal justice system, concentrating on police and law enforcement; plea-bargaining; courtroom research and trial

strategies; sentencing; and prisoners' right and corrections. The relationship between race, social class and crime is also considered, as are the sociological explanations of crime causation.

21.835 Theories of Criminology
Theories and philosophies, underlying various correctional systems. Schools of thought in criminology and penology. Theoretical approaches to the crime and delinquency problem from the beginnings of criminology to current thinking.

21.837 Sociology of Law
Fundamentals of law. The concept of social control. Order and Law. Consensus and conflict. Analysis of the normative-formative influences of law. Mores and morals. The concept of justice. Analysis of some legal institutions.

21.840 Sociology of Medicine
Social aspects of illness and medicine, historically and cross-culturally. Illness and the medical profession in modern society and their structural settings: the community, the hospital, the medical school. Research studies in the field will be examined critically and problems for future research will be specified.

21.843 Sociology of Education
The structure and functioning of educational institutions. Student, faculty, and administrative perspectives. Emphasis will be placed on the role of education in processes of socialization, social mobility, social change, and social control.

21.847 Formal Organizations: Administration and Structure
Analysis of the goals and functions in modern organizations. Aspects of bureaucratization will be examined within business firms, public institutions, and private associations.

21.850 Sociology of Occupations and Professions
The relations between the occupations and professions and society. Special topics may include occupational stratification, professional group behavior, recruitment and socialization of occupations and professions, and political activism.

21.855 Political Sociology
Sociological analysis of power relations and power systems with special attention to the bases of political power, processes of change in power, and the part played by violence and revolutionary movements.

21.857 Economic Sociology
The role of economic factors in the social process. Consideration will be given to both classic economic theory and its impact on classic social theory, and the potential interrelations between modern economic theory (especially model-building approaches) and general sociological problems.

21.860 Intergroup Relations
The relations between various racial, nationality, cultural, and religious groups with emphasis on historical development. Particular attention will be paid to American society with its specific problems of adjustment and assimilation.

21.861 Sociology of Prejudice and Discrimination
A study of the characteristics, causes, and consequences of prejudice and discrimination, with particular reference to American society.

21.863 Sociology of Religion
A sociological analysis of religious institutions and experiences in their historical and contemporary content. Religion and political content will be considered.

21.865 Sociology of Knowledge
The relationship between the social base of a society and its intellectual products. The viewpoints of authors such as Marx, Weber, Mannheim, G. H. Mead, the Neo-Marxian, and other modern schools will be considered. *Prep. Three terms of graduate theory.*

21.870 The Family
Social structure and social functions of the family as a social institution. Relations between the family and other institutions in society will be examined comparatively and historically.

21.873, 21.874 Childhood and Adolescence I, II
Growth and development of the child in the social context. Primary socialization in the family including the transmission of role expectations, values, and the development of self concept. Secondary group socialization in school, neighborhood, and peer group.

21.877 Theories of Socialization
A critical examination of the major theories in the field. Attention will be focused on the work of Freud, Piaget, Cooley, Mead, Parsons, and Merton.

21.880 Community Analysis
Ecological theories of man's relation to his physical environment. Development of the concept, and discussion of methods for community study. Comparison between rural communities and urban neighborhoods. Discussion and evaluation of community action programs.

21.881 Community Research Lab.

21.885 Urban Sociology
Theories of the development of urban life. Comparisions between pre-industrial and industrializing urban areas. Methods for the study of urban social structure and change. Evaluation of contemporary metropolitan action programs.

21.886 Seminar in Urban Social Policies
Social science theories and methods are evaluated from the perspectives of urban affairs. *Consent of instructor.*

21.887 Sociology of Policy, Planning and Evaluation
A general introduction to the social, political and economic factors affecting policy formation and the eventual success or failure of social programs in health, education, welfare, and urban planning. Stress on evaluation of policy alternatives, and planning problems. For advanced students in the social sciences and in the various human service schools of the university.

21.888 Metropolitan and Regional Issues
Comparative analysis of problems, policies, programs, and activities associated with metropolitan and regional life. Includes assessment of values, institutions, networks, interest groups, decision-making, service delivery, growth and development, environment, equity, and integration. Case studies in societal context.

21.889 Boston Seminar
A case study in urban development, including the evaluation of environmental and historical circumstances, demands for services, response to events, programs. Basis for value systems of Yankees, ethnics, and cosmopolitans. Impact on downtown and neighborhood relations. Metropolitan prospects.

21.890 Middle East Area Study
Socio-cultural analysis of the Middle East. Ecological, structural, institutional, and normative factors in nomadic, rural, and urban life. Comparative regional analysis.

21.895 Latin American Societies
Study and analysis of selected Latin American societies with particular attention to such countries as Cuba, Mexico, Peru, and Brazil. Emphasis on urbanization and industrialization, social and political change.

21.900 Issues in Social Psychology
Human behavior and theories of self from a sociological and psychological perspective. Special consideration of interpersonal relations, socialization, and symbolic interaction.

21.910 The Sociology of Science
Selected topics dealing with interactions between science and society. *Consent of instructor.*

21.912, 21.913 Experimental Methods in Social Research I, II
This course covers experimental design and laboratory methods in sociology. The small groups laboratory is treated as a setting for testing sociological theory. The emphasis is upon techniques and problems in the creation and manipulation of social variables in the laboratory situation, although the techniques of the natural experiment are also considered.

21.914 Rhetoric in Sociology
Critical examination of the conventional forms of sociological writings. How conventions differ by theoretical perspective and paradigm.

21.915 Seminar in Symbolic Interaction
The social psychology of groups as found in the works of Mead, Becker, Blumer, Goffman, and others.

21.916, 21.917 Seminar in Qualitative Analysis I, II (4 q.h. each quarter)
Qualitative techniques of analysis. Social structure process and meaning in interacting groups. Each student studies a face-to-face group by means of participant observation using symbolic interaction concepts.

21.920 Social Stratification
Theories of inequality between groups in historical perspective, from classical to modern industrial times. Discussion and evaluation of sociological research in social stratification in regard to different social and cultural groups.

21.930, 20.930 Social and Cultural Change S, A
Two-quarter course, in conjunction with Anthropology.
Analysis of the changing patterns in social, economic, and political institutions. Modern social trends are discussed.

21.940, 21.941 Social Control I, II
Seminar in research, theories, and methods in the sociology of social control.

21.950, 21.951 Seminar in Social Structure I, II
Seminar relating current theories and research in sociology, social psychology, and social anthropology.

21.960, 21.961, 21.962 Seminar on Socialization I, II, III
I. Instructor reviews theories and findings in organizational socialization. II. Students design studies in organizational socialization. III. Students present results of their studies. *Not open to first year students.*

21.980, 21.981, 21,982, 21.983 Contemporary Issues in Sociology
Contemporary issues in sociology. Supervised readings and written reports on special problems.

21.990 Seminar (maximum: 9 q.h.)
Discussion of selected topics in the field of sociology.

21.991 Master's Paper in Sociology (4 q.h.)
Supervision by members of the department. Empirical or library research meeting the criteria for publication in a professional journal.

21.992, 21.993, 21.994 Directed Study in Sociology (Maximum: 9 q.h.)
Reading and research under the direction of a faculty member. *Open to doctoral candidates with the consent of the graduate committee.*

21.995 Doctoral Dissertation

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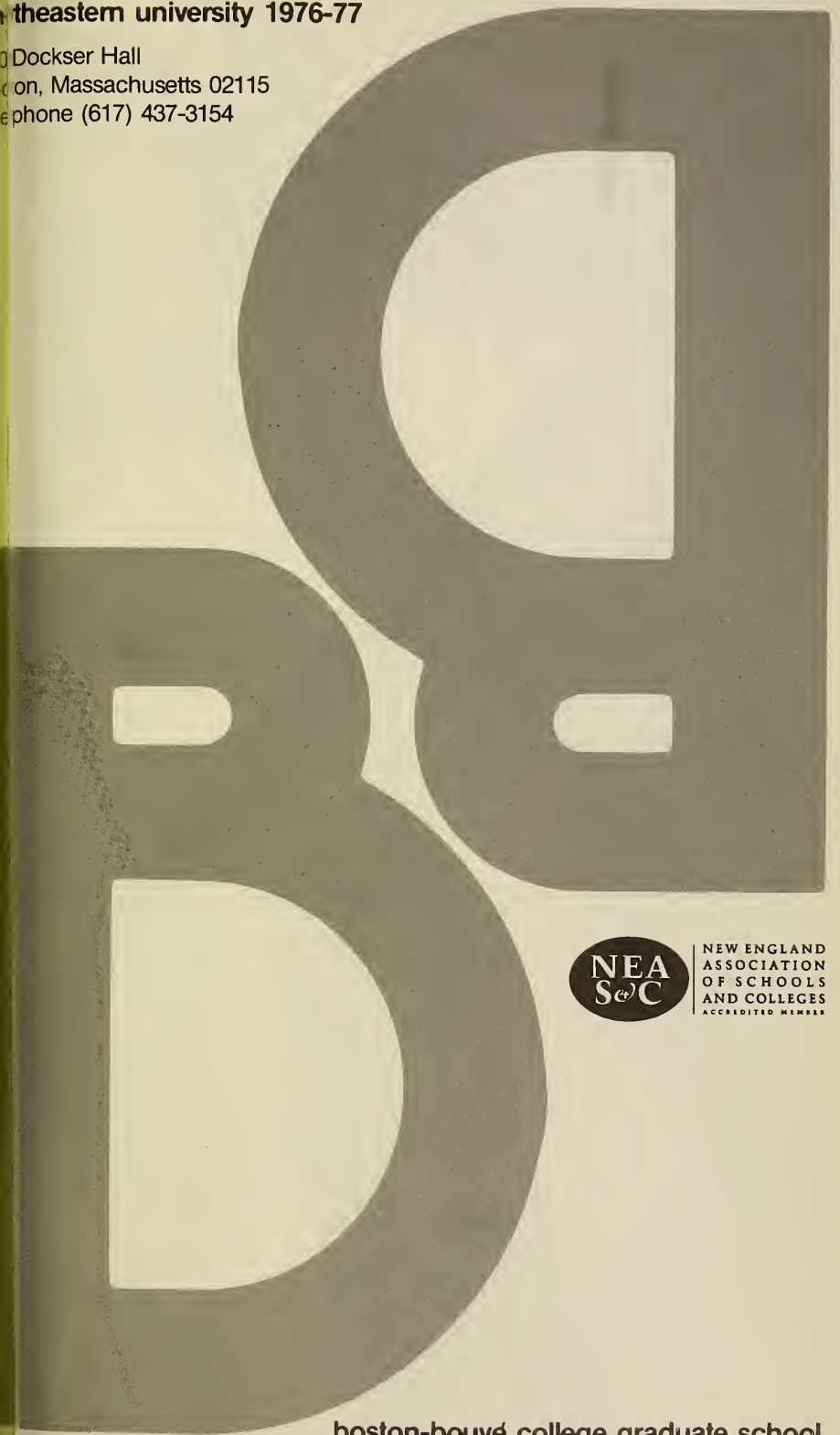

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NORTHEASTERN

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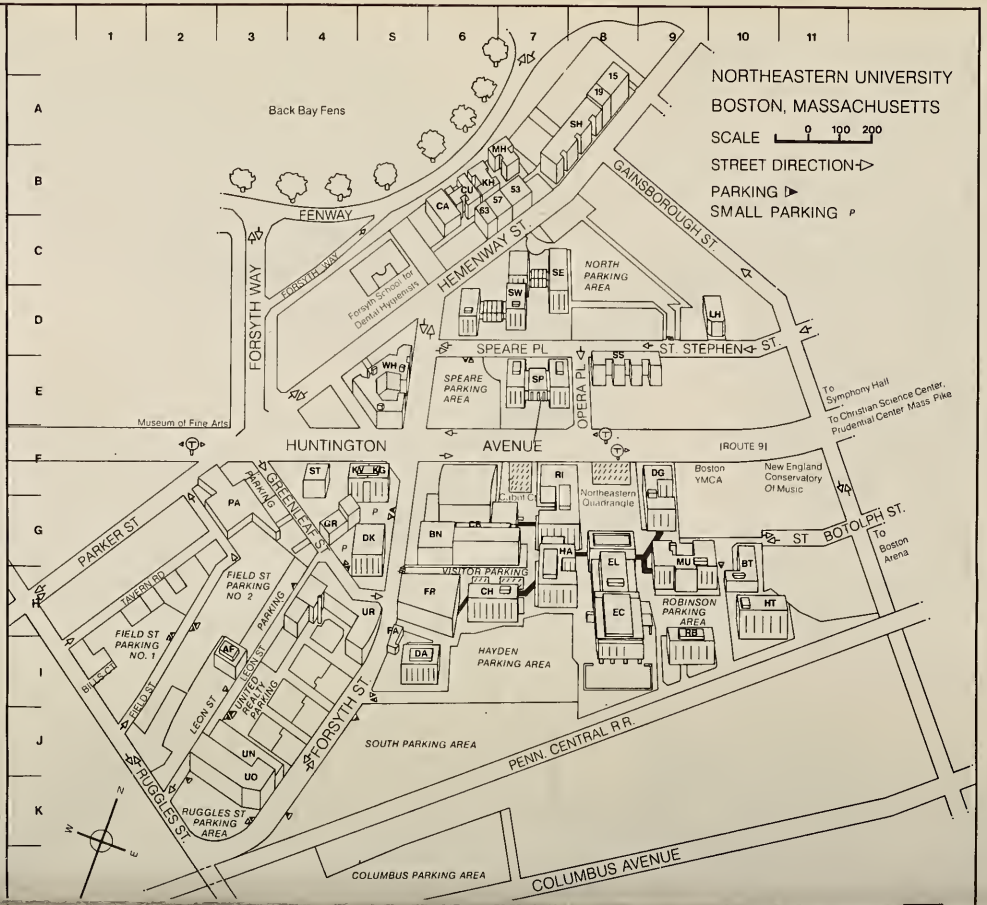
Academic and Service Buildings	Map Code	Bldg. Code
African-American Institute	I3	AF
Barletta Natatorium	G6	BN
Botolph Building	G10	BT
Cabot Physical Education Center	G6	CB
Cahners Hall	C6	CA
Churchill Hall	H6	CH
Cooperative Education Building	F4	ST
Cushing Hall	B6	CU
Dana Research Center	I5	DA
Dockser Hall	G5	DK
Dodge Library	G9	DG
Ell Student Center (Auditorium section)	G8	EL
Ell Student Center (Student Lounge section)	H8	EC
Forsyth Building	H6	FR
Forsyth Building Annex	H5	FA
Greenleaf Building	G4	GR
Hayden Hall	G7	HA
Hurtig Hall	H11	HT
Kerr Hall (Faculty Center)	B6	KH
Knowles Center (Gryzmish Hall section)	F5	KG
Knowles Center (Volpe Hall section)	F5	KV
11 Leon Street	J3	UO
15 Leon Street	J3	UN
Mugar Life Sciences Building	G9	MU
Parker Building	G3	PA
Richards Hall	F7	RI
Robinson Hall	H10	RB
United Realty Building	H5	UR
Dormitories		
115 Hemenway Street	A8	15
119 Hemenway Street	A8	19
153 Hemenway Street	B7	53
157 Hemenway Street	B6	57
163 Hemenway Street	C6	63
Kerr Hall	B6	KH
Light Hall	D10	LH
Melvin Hall	B7	MH
106-122 St. Stephen Street	E8	SS
Smith Hall	B8	SH
Speare Hall	E7	SP
Stetson Hall East	C7	SE
Stetson Hall West	D7	SW



ACADEMIC CALENDAR 1976—1977

Fall Quarter 1976

Registration period		
Burlington	Tuesday—Wednesday	Sept. 14—15
Boston	Monday—Thursday	Sept. 20—23
Classes begin	Monday	Sept. 27
Examination period	Monday—Saturday	Dec. 13—18

Winter Quarter 1976—1977

Registration period		
Burlington	Tuesday	Nov. 30
Boston	Monday—Thursday	Dec. 6—9
Classes begin	Monday	Jan. 3
Examination period	Monday—Saturday	Mar. 21—26

Spring Quarter 1977

Registration period		
Burlington	Tuesday	Mar. 8
Boston	Monday—Thursday	Mar. 14—17
Classes begin	Monday	Apr. 4
Last day to file card for Spring Commencement	Friday	Apr. 1
Last day to pay fee for Spring Commencement	Friday	Apr. 29
Final grades due in Registrar's Office for June graduates	Friday	June 3
Examination period	Monday—Saturday	June 13—18
Spring Commencement	Sunday	June 19

Summer Quarter 1977

Registration period		
Burlington	Monday—Tuesday	June 13—14
Boston	Wednesday—Thursday	June 15—16
Classes begin	Monday	June 27
Last day to file card for Fall Commencement	Friday	July 1
Last day to pay fee for Fall Commencement	Monday	Aug. 1
Examination period	Wednesday—Thursday	Aug. 3—4

UNIVERSITY HOLIDAYS 1976—1977

Columbus Day	Monday	October 11
Veterans' Day	Thursday	November 11
Thanksgiving Recess	Thursday—Saturday	November 25—27
Christmas Vacation	Monday—Saturday	Dec. 20—Jan. 1
Martin Luther King Day	Saturday	January 15
Washington's Birthday	Monday	February 21
Patriot's Day	Monday	April 18
Memorial Day	Monday	May 30
Independence Day	Monday	July 4
Labor Day	Monday	September 5

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admissions, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or on the basis of being a handicapped but otherwise qualified individual. In addition, Northeastern takes affirmative action in the recruitment of students and employees.

the governing boards and officers of the university

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Charles F. Adams
Vernon R. Alden
William T. Alexander
William F. Allen, Jr.
O. Kelley Anderson
*Diana J. Auger

Allen G. Barry
Lincoln C. Bateson
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*Roy H. Beaton
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*David H. Cogan
Abram T. Collier
William A. Coolidge
Edward Creiger
H. James Crossan, Jr.

Roger C. Damon
*Edward Dana
William O. DiPietro
Alfred di Scipio
Estelle Dockser (Mrs.)
*William R. Driver, Jr.

*Carl S. Ell
*Byron K. Elliott
*William P. Ellison
Joseph A. Erickson
Robert Erickson

*Frank L. Farwell
*James V. Fetchero
Eldred L. Field
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University Graduate Council
1976—1977

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the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of nearly 180 distinguished business and professional men and women.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964); Boston-Bouvé College (1964); the College of Criminal Justice (1967); and by Lincoln College's daytime Bachelor of Engineering Technology program (1971). This educational method enables students to gain valuable practical experience as an integral part of their college program and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, actuarial science, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. University College offers evening courses — offered by the University since 1906 — and adult-day courses leading to the bachelor's degree. In addition to offering day undergraduate programs in Electrical Engineering Technology and Mechanical Engineering Technology, Lincoln College offers evening/part-time certificate, associate, and bachelor's degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the Basic College faculties concerned.

GRADUATE AND PROFESSIONAL SCHOOLS

The 10 graduate and professional schools of the University offer day and evening programs leading to the degrees listed.

The Graduate School of Actuarial Science offers the degree of Master of Science in Actuarial Science.

The Graduate School of Arts and Sciences offers the degrees of Master of Arts, Master of Science, Master of Science in Health Science, Master of Public Administration, and Doctor of Philosophy.

The Graduate School of Boston-Bouvé College offers the degree of Master of Science with specializations in Physical Education and Recreation Education.

The Graduate School of Business Administration offers the degree of Master of Business Administration.

The Graduate Program in Criminal Justice offers the degree of Master of Science.

The Graduate School of Education offers the degrees of Master of Education and Doctor of Education and the Certificate of Advanced Graduate Study.

The Graduate School of Engineering offers the degrees of Master of Science, Engineer degree, Doctor of Engineering, and Doctor of Philosophy.

The School of Law offers the degree of Juris Doctor.

The Graduate School of Pharmacy and Allied Health Professions offers the degrees of Master of Science and Doctor of Philosophy.

The Graduate School of Professional Accounting offers the degree of Master of Science in Accounting.

CENTER FOR CONTINUING EDUCATION

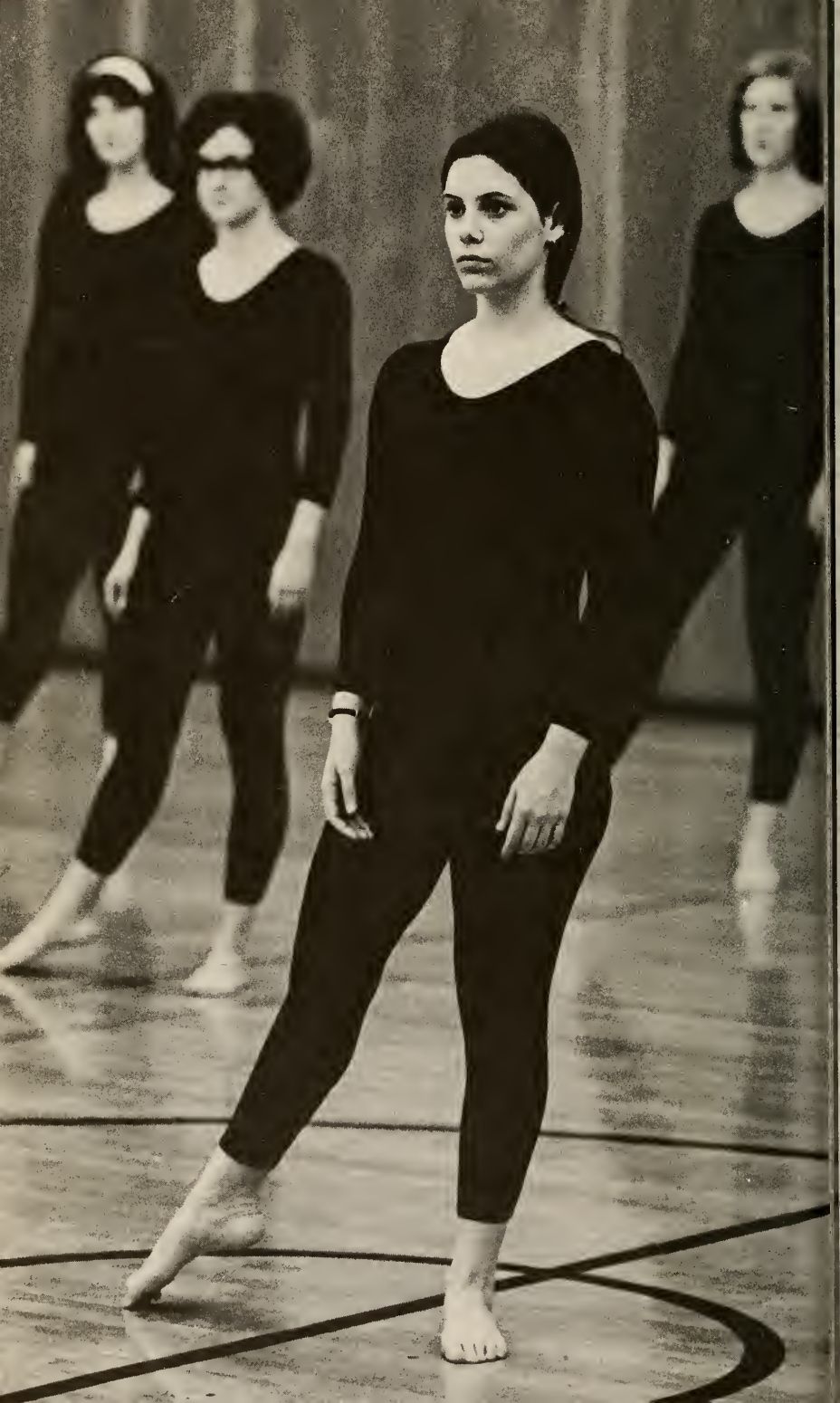
The Center of Continuing Education was established in 1960 to relate the University to the needs of its community in a period of accelerated change. Adult education programs offered by the Center and University College have since been consolidated. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

RESEARCH ACTIVITIES

The facilities of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning take place in an environment characterized by research activities directed toward extending the frontiers of knowledge.



buildings and facilities

MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, the Boston Public Library, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 48 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

Ell Student Center

The Carl S. Ell Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

Libraries

The University library system consists of the Dodge Library, which is the main library; the Suburban Campus Library at Burlington; the School of Law Library; and divisional libraries for Physics and Electrical Engineering, Chemistry and Biology, Mathematics and Psychology, and Health, Physical and Recreation Education, and Physical Therapy. There are additional subject collections for the Center for Management Development at Andover, Massachusetts, and the Marine Science Institute in Nahant.

The library collections number 400,000 volumes supplemented by some 333,000 titles in microprint, microfilm, and microfiche forms. The collection includes, in addition, some 3,700 periodical titles, 100,000 documents, and 4,600 sound recordings.

Cabot Physical Education Center

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. The large gymnasium contains four basketball courts. In addition, the Center consists of an athletic cage, a small gymnasium, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouvé College.

A recent addition to the Center, the Barletta Natatorium, houses a 105-foot swimming pool, a practice tank for the crew, handball courts, and shower and dressing facilities.

Dockser Hall

Charles and Estelle Dockser Hall, the main Boston-Bouvé College building, completed in 1968, houses a large gymnasium, dance studio, motor performance laboratory, college library, community recreation laboratory, folk arts center, dark and music rooms, recreation resources area, locker rooms, offices, classrooms, conference room and lounge, storage facilities, and a research laboratory.

Apartments for Graduate Students

The University maintains a 100-apartment housing unit which accommodates 279 people. Two-, three-, and four-party apartments are available which vary in size from two to four rooms plus bath. Apartments are furnished with beds, chairs, desks, stove, refrigerator, and kitchen table. The cost includes all utilities.

A $100 deposit is required when making application for the apartments. Applications are available in the Office of University Housing. Students are expected to make such arrangements on a term-to-term basis but may live in the apartments both while on cooperative work assignments and in school if they wish. All reservations are made on a first come, first served basis.

SUBURBAN FACILITIES

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

Warren Center

The Warren Center is a practical laboratory for Boston-Bouvé College in outdoor education and conservation, in group practicum, and in camping administration, programming, and counseling. At this Center in Ashland, completed in 1967, there are tennis courts, field hockey and lacrosse fields, waterfront for swimming and boating, overnight camp sites, fields and forests, heated cottages, the Hayden Lodge with a recreation hall, library, crafts shop, dining facilities, and conference accommodations.

Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

Marine Science Institute

The Marine Science Institute at Nahant, Massachusetts, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated all year, and is about 20 miles northeast of Boston. Many of the courses at this institute are applicable toward an advanced degree in biology or health science.

Government Center Campus

With the cooperation of the Federal Executive Board, the Graduate School of Liberal Arts' Department of Political Science offers an entire Master of Public Administration program at the John F. Kennedy Building in downtown Boston. This program is primarily for individuals employed in Federal, state, or local civil services.

Brockton, Nashua, and Framingham Campuses

For students residing in southeastern Massachusetts and northeastern Rhode Island, the Graduate School of Business Administration offers a significant portion of its M.B.A. Program at facilities in Brockton, Massachusetts. These facilities, made available by the Knapp Corporation, are located on West Chestnut Street in Brockton.

Students residing in the southern New Hampshire area may take a significant portion of the M.B.A. Program at facilities in Nashua, New Hampshire. These facilities are furnished by Sanders Associates, Inc. and are located in their headquarters on Route 3, just over the Massachusetts line.

For students in the Framingham-Worcester area, a significant portion of the M.B.A. Program may be taken at classroom facilities located in Framingham, Massachusetts.

boston-bouvé college graduate school

The purposes of advanced study in Boston-Bouvé College are consistent with the philosophy of Northeastern University, and with the goals of advanced study in the professions. The programs are designed to fulfill the needs and interests of personnel in health, physical and recreation education and physical therapy in an era of social and educational change and redirection.

Graduate study is founded in the fields of knowledge and specialization which are extensively explored in upper-division or upper-class years of undergraduate preparation. The nature of advanced study leading to the master's degree demands of students and faculty attitudes of intensive critical analysis; cognitive development of idea and thought reliably tested in scholarly search and discussion, with application involving educational resources and practice; specialized research and creative experimentation in emerging theories, with application in the primary specialized field and its ancillary contexts; exploration and development of new trends in curriculum theory, process, and evaluation; critiques of professional reading and related literature; conversance with diverse methods and interpretation of scientific, philosophic, historical, and descriptive research; and a depth study using the appropriate research method in an approved investigation or thesis/project under faculty advisement.

The goals of graduate education in Boston-Bouvé College are:

1. To provide advanced preparation for administrators, supervisors, therapists, teachers, recreation specialists, coaches, and researchers through specific professional study and interdisciplinary experience.
2. To develop appreciation for the orderly approach to discovery through research, philosophical thought, and discussion.
3. To provide a sound basis for research and to facilitate student research experiences and applications.
4. To contribute to the development and refinement of dance, games, sports, recreation, and outdoor education within their cultural settings, and through comparative study.
5. To develop leaders and teachers capable of designing current and innovative approaches to learning and curriculum development.
6. To encourage intensive study in a specialized area of concern, with awareness of problems in education and society.
7. To provide a foundation for advanced study at the doctoral level.

PART-TIME STUDY

Graduate programs in Boston-Bouvé College are structured to provide an opportunity for the master's degree candidate to attend classes in the late afternoon or evening while continuing his/her full-time employment. By judicial use of electives and independent study, an unemployed student may carry the equivalent of a full-time course load.

Students normally take one or two courses per quarter and can complete the degree program in two to three years, depending upon whether or not course work is taken during the summer quarter.

Students maintaining a satisfactory academic standing may petition the Director of the Graduate School for permission to take more than two courses per quarter.

GENERAL REGULATIONS

The general regulations and minimum requirements for all graduate programs are established by the Northeastern University Graduate Council. In some matters the committee of each graduate school is allowed discretion to establish regulations within limits defined by the Council. The regulations and academic requirements which follow have been formulated in accordance with this general policy.

Application

All applicants should address inquiries to Boston-Bouvé College Graduate School. Application forms and information will be mailed promptly.

Registration

Students must register within the period listed on the school calendar. Registration will not be permitted after this period.

Residence

All work for advanced degrees must be completed in residence at the University, unless approval has been obtained from the Director of the Boston-Bouvé College Graduate School for work taken elsewhere. Students who are in residence and using the facilities of the University must register for such work.

Grading System

The performance of students in graduate courses is recorded by the instructor, using the following grades:

A Excellent
For performance of high graduate caliber

B Satisfactory
For performance at a satisfactory level
C Fair
For performance not at the level expected in graduate work
F Failure
For unsatisfactory performance

In addition, the following letter designations are used:

I Incomplete
For failure to complete course work
S Satisfactory without quality designation
For satisfactory completion of course work
U Unsatisfactory without quality designation

The grades S and U are used for the first quarter of a two-quarter sequence in which the second-quarter grade applies to both the first and second quarters of the sequence: e.g., Thesis I and II.

The designation I is to be changed to a grade upon removal of the deficiencies which caused the I to be reported. Deficiencies must be removed within the quarter following that for which the I is received, unless an extension of time is granted by the instructor. However, such extension of time may not exceed two additional consecutive calendar quarters. Grades of Incomplete received in Thesis I and II may be continued beyond the two-quarters' limit, but must be removed prior to graduation and within the six-year time limitation.

Any student who wishes to take a make-up examination must obtain permission from the Director of Boston-Bouvé College Graduate School by the second week of the quarter succeeding that in which the examination is missed. The make-up examination must be taken in that succeeding quarter unless circumstances warrant permission from the Director to defer it to the second succeeding quarter.

Class Hours and Credits

All credits at Northeastern University are entered as quarter-hour credits, with a quarter hour of credit being equivalent to three-fourths of a semester hour, i.e., 12 semester hours are equal to 16 quarter hours.

All classes in the Boston-Bouvé College Graduate School meet on a quarter basis, with an academic quarter defined as a term of approximately 12 weeks' duration. In the summer quarter, classes meet in a term of six weeks' duration. The academic calendar in the front of this bulletin should be consulted to determine the opening dates of each quarter.

Continuity of Program

Students are expected to maintain continuous progress toward a degree. Any student who does not attend Northeastern for a period of one year must apply for readmission.

Withdrawals

In order to withdraw from a course, a student must fill out an official withdrawal form obtained at the Registrar's Office or at the Burlington Campus. Withdrawals may be made through the ninth class meeting of the quarter. Students will be withdrawn as of the date on which they complete the form. Ceasing to attend a class or notifying the instructor does not constitute an official withdrawal. Petitions for withdrawal from a course after the ninth class meeting of the quarter must be submitted to the Director of the Graduate School, and may be approved to avert unusual hardships on the student.

Students who do not attend the first two sessions will be dropped from the class unless they notify the Registrar of their intention not to withdraw.

Changes in Requirements

The continuing development of the Graduate School forces frequent revision of curricula. In every new bulletin, some improvements are indicated. When changes impose no hardship on the student and school facilities permit, the student is expected to meet the requirements of the latest bulletin. If the student finds it impossible to meet these requirements, the bulletin for the year in which he entered becomes the binding one.

Application for the Diploma

If a commencement card is not filed with the Registrar's Office on or before the applicable date listed on the calendar, there is no assurance that the degree will be granted in that particular year, even though all other requirements have been fulfilled.

THE MASTER OF SCIENCE DEGREE

Admission to Degree Candidacy

For admission to the Boston-Bouvé College Graduate School, a degree candidate must have presented the following to the Director of the Graduate School:

1. A completed application and $15 application fee.
2. Official transcript(s) from accredited institution(s) as evidence of successful completion of the baccalaureate degree. The transcript(s) should show a cumulative average of 2.5 or better and a minimum of 18 semester hours or 24 quarter hours of work in the student's proposed major or the equivalent in professional background.
3. Record of an interview with the Director of the Boston-Bouvé Graduate School or designate — required only if candidate has an undergraduate degree unrelated to the area of specialization or has less than a 2.5 cumulative average.
4. Three references from persons familiar with the applicant's professional, academic, and character background.
5. An official record of the Miller Analogies Test score.

It is recommended that all materials be on file in the office of Boston-Bouvé Graduate School before registration for the first graduate course. In no case will a conference and course registration be permitted without a minimum of a completed application and a copy of the undergraduate transcript. The additional materials — the Miller Analogies Test score and references — *must* be received no later than the end of the first quarter. A student may not continue in the program unless these conditions are fulfilled.

Academic Classifications

Students whose materials meet the criteria above are classified as regular students.

The Director of Boston-Bouvé College Graduate School may admit any person as a special student who presents evidence of a bachelor's degree and who appears otherwise prepared to undertake study in the Graduate School. Admission is on the provision that the applicant: a) files an application and b) acknowledges that subsequent to being reclassified as a degree candidate, only 12 quarter hours of academic credit earned as a special student may be applied toward a degree.

Academic Requirements

A candidate for the master's degree must complete an approved program conforming to requirements of the department in which the candidate is registered. At the discretion of the Graduate Committee, any student whose record is not satisfactory may be dropped from the program. A minimum of 48 quarter hours of correlated, graduate-caliber work, along with other study required by the department, must be completed.

An average grade of at least B must be obtained in the quarter hours of credit required for the degree, excluding any transfer credits. Not more than eight quarter hours of extra or repeated courses are allowed to satisfy grade requirements for the degree.

Within the above limitations, a required course for which a grade of F is received must be repeated with a grade of C or better, and may be repeated only once. If a grade of F is received in an elective course, that course may be repeated once to obtain a grade of C or better, or another elective course may be submitted. If a grade of C is received in a required course, that course may be repeated once to obtain a grade of B or better.

A degree candidate's record is subject to review by the Boston-Bouvé College Graduate Committee upon completion of his/her sixth course at Northeastern University. At this time, the student must have made reasonable progress in achieving his/her program objectives, and have obtained at least a B average. If the requirements are met, he/she is encouraged to continue the program. In the event his/her record is unsatisfactory, he/she may be dropped as a degree candidate from the Boston-Bouvé College Graduate School.

Program Selection

Upon acceptance as a degree candidate, the student is assigned to a program adviser in his/her major area of concentration. In consultation with his/her adviser, the student develops a program of study, including program objectives, anticipated courses, and estimated dates for completion of the various degree requirements. Prior to completion of the first 12 quarter hours of credit, the program requires approval by the Boston-Bouvé College Graduate Committee. Any subsequent changes in program require further Committee approval.

Transfer Credits

A maximum of 12 quarter hours of credit obtained at another institution is accepted toward the master's degree, provided that the credits are recommended for transfer by the student's program adviser; consist of work taken at the graduate level for graduate credit; carry grades of A or B; have been earned at a recognized institution; and have not been used toward any other degree. Students should petition the Director of the Graduate School in writing for all transfer credit, completing the necessary form obtainable from either the office of Boston-Bouvé College or the faculty program adviser. This form should be submitted to the student's program adviser along with an official transcript and a course description. Grades on transfer credits may not be used in obtaining the academic average necessary for completion of degree requirements.

Time Limitations

Course credits earned in the graduate study program or accepted by transfer are valid for a maximum of six years from the date of course completion unless an extension is granted by the College Graduate Committee.

Comprehensive Examination

A comprehensive subject-matter examination is taken by each candidate no later than two weeks before his commencement. This examination may be taken when the candidate has completed at least three-fourths of the designated course work, and received consent of his program adviser. The comprehensive examination is prepared by selected graduate faculty with whom the student has studied. The areas to be tested are commensurate with the student's specialization, area of concentration, and core subject matter appropriate to his professional field. The program adviser makes arrangements for the preparation of the test. Faculty members preparing the examination assume responsibility for its reading and grading, and for informing the adviser of results. Test results are reported by the program adviser to the Director of the Boston-Bouvé College Graduate School.

Each section of the examination is graded on the basis of A, B, C, or F. The candidate's total grade must average to the grade of B. Grades of F are not acceptable. A student failing all or part of the examination may, upon

the recommendation of his adviser, be given one re-examination. Conditions governing re-examination are determined by the Director of the Graduate School or an appropriate designate.

Thesis/Project

Each candidate must submit a thesis or project which clearly exhibits his/her research ability, and is designed to increase the scope of his/her individual specialization. The proposal is submitted to the program advisor for approval. Upon initial approval, an advisor and two additional committee members are appointed by the Director of the Graduate School at the recommendation of the program advisor. The thesis or project proposal and completed document must be approved by the thesis/project committee and the Director of the Graduate School.

financial information

FINANCIAL OBLIGATIONS

Tuition

Tuition rates and fees are subject to revision by the Board of Trustees at any time. However, any change in tuition and fees will become effective at the beginning of the school year which follows the one in which the change was announced. Tuition for master's degree candidates and special students is $55 per quarter hour of credit.

Tuition statements are mailed to students by the Bursar'sOffice and are payable by check to Northeastern University on or before the date specified.

Fees

All applications must be accompanied by a nonrefundable application fee of $15. No application will be processed until the fee has been received by the Graduate School of Boston-Bouvé College. Checks should be made payable to Northeastern University and sent, with the application, to Director of Graduate School, 100 Dockser Hall.

Other fees include a charge of $10 for late payment of tuition; a fee of $2 for deferred tuition (with approval of Bursar); a final examination make-up fee of $5; and a fee of $25 for all degree candidates, payable before commencement by the applicable date listed on the academic calendar.

All part-time students on the Huntington Avenue Campus are charged $.75 a quarter for the services available in the Student Center.

All financial obligations to the University must be discharged by graduation.

Refunds

Tuition refunds are granted only on the basis of the date appearing on the official withdrawal form filed by the student. Non-attendance does not constitute official withdrawal. Questions regarding refunds should be discussed with Bursar's Office.

Refunds will be granted in accordance with the following schedule:

Official Withdrawal Filed Within:	Percentage of Tuition Refunded:
First week of quarter	100
Second week	75
Third week	50
Fourth week	25

FINANCIAL AID

There is a limited amount of financial aid for part-time students enrolled in Boston-Bouvé College Graduate School. Graduate assistantships and/or fellowships in the College are not available to part-time students. There are a limited number of teaching assistantships available to qualified full-time graduate students. Assigned duties require 18-20 hours per week for which the student receives a $3,000 stipend and tuition waiver. Further information and applications may be obtained from the Boston-Bouvé College Graduate Office.

Martin Luther King, Jr., Scholarships

Established in 1969 in memory of the late Rev. Martin Luther King, Jr., awards are made as openings occur to qualified minority graduate students who show financial need and are accepted to full-time study in the graduate schools of the University. Stipends will cover tuition and all fees.

Dormitory Proctorships

A number of proctorships in men's dormitories on or near the Huntington Avenue Campus are available each year. Appointments carry a minimum compensation of room and board. Further information and application forms may be obtained from the Office of University Housing.

National Direct Student Loan

This program is available to students who are carrying at least one-half the normal academic work load, are accepted as degree candidates, and who show evidence of financial need.

The Federal maximum which a graduate student may borrow while pursuing a post-baccalaureate degree is $5,000.

Repayment and interest on these loans do not begin until nine months after the student ceases to carry at least a half-time academic load at an institution of higher education. The repayment of principal may be extended over a 10-year period with the interest at the rate of three percent per annum. Repayment may be deferred up to a total of three years while a borrower is serving as a Peace Corps or VISTA volunteer.

Guaranteed Student Loan Program

Under this program, students who are matriculated degree candidates, enrolled for at least one-half the normal academic work load, may borrow from a participating bank or other financial institution. Terms and conditions vary from state to state, but a student generally may borrow up to $1,500 a year (the law allows a maximum of $2,500 per year) depending on financial need. The Federal government pays the interest while the student is in school if the student is eligible for interest subsidy.

The student must have submitted, through the College Scholarship Service, a Parents' Confidential Statement; or if he has been declared financially independent by the Financial Aid Office, a Student's Confidential Statement. These forms are available in the Financial Aid Office.

Applications for the loan itself are available from local banks or the Education Office of your state government. Additional information and necessary application forms for Massachusetts residents are available from the Financial Aid Office.

faculty

GRADUATE TEACHING FACULTY OF BOSTON-BOUVÉ COLLEGE

Allen, Catherine L., B.S., M.A., Ed.D., Ph.D., *Dean of Boston-Bouvé College. Director of Boston-Bouvé College Graduate School, and Professor of Health, Physical Education and Recreation*

Christensen, Carl S., B.S., M.S., Ph.D., *Professor of Physical Education and Chairman of the Department*

Curtin, Robert S., B.S., M.Ed., *Assistant Professor of Physical Education*

Fox, John W., A.B., M.A., Ed.D., *Professor of Physical Education*

Garman, Betty Gene, B.S., M.P.H., *Assistant Professor of Physical Therapy*

Garrity, H. Marie, B.S.Ed., Ed.M., Ed.D., *Professor of Health Education and Executive Officer of the Department.*

Gillespie, William Jay, B.S., M.Ed., *Assistant Professor of Physical Education*

Jeffrey, Howard, A.B., M.A., D.R., *Associate Professor of Recreation Education*

Kassabian, Kerkor, B.S., Ed.M., *Associate Professor of Physical Education*

Lintner, Marie A., B.S., M.S., Ph.D., *Assistant Professor of Physical Education*

Luttgens, Kathryn, B.S., M.S., Ph.D., *Professor of Physical Education*

McCay, Albert H., B.A., M.A., Ed.D., *Professor of Recreation Education and Chairman of the Department*

Morrison, Richard, B.A., M.S., Ed.D., *Associate Professor of Recreation Education*

Neilson, Elizabeth, B.S., M.Ed., Ed.D., *Adjunct Professor of Health Education*

Philbrick, Barbara, B.A., M.S.Ed., Ph.D., *Associate Professor of Physical Education*

Robinson, Frank, B.A., M.S., *Associate Professor of Recreation Education*

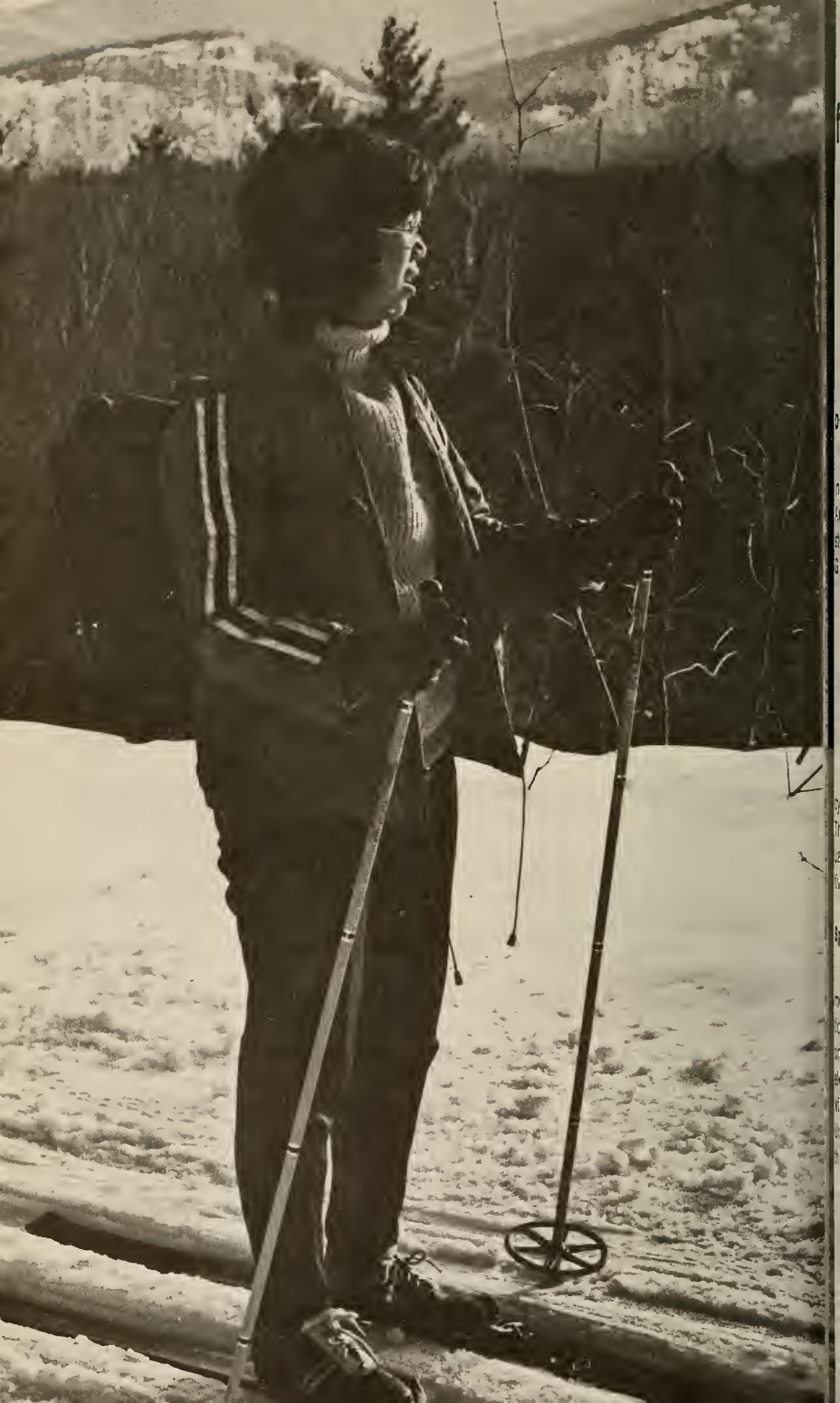
Robinson, Sarah, B.S., M.S., Ph.D., *Associate Professor of Physical Education*

Rowlands, Jeanne L., B.A., B.S., M.A., *Professor of Physical Education*

Sayed, Alae-Eldin, B.S., M.S., Ed.D., *Associate Professor of Recreation Education*

Van Slyck, Elizabeth W., B.S., M.A. *Professor of Physical Therapy and Executive Officer of the Department*

Zobel, Richard C., B.S., M.A., Ed.D., *Professor of Physical Education*



fields of study

PROGRAMS IN PROFESSIONAL SPECIALIZATIONS

Master of Science

Description

All students must complete one of the programs as outlined in the following pages. In almost all cases the sequence is designed to be very flexible. Any variations or changes must have the prior recommendation of the student's program adviser and approval of the Boston-Bouvé College Graduate School Director.

Core Courses Required of All Candidates
50.841 Introduction to Educational Statistics
66.802 Research Design and Methodology
66.890 Thesis/Project I
66.891 Thesis/Project II

Competency, as demonstrated by the successful completion of proficiency examination, is accepted in lieu of Statistics and/or Research Design. The candidate must petition the Director of Boston-Bouvé College Graduate School for permission to attempt the proficiency examination. An elective course must be substituted for a core course which has been waived.

Specialization in Physical Education

For a specialization in Physical Education, 20 quarter hours of departmental courses are required. Eight quarter hours are selected from foundation courses taken within Boston-Bouvé College and 12 quarter hours from one of the five areas of concentration. In addition, 12 quarter hours of free elective courses appropriate to the student's program are selected from within Boston-Bouvé College or from other Colleges at Northeastern University. Foundation electives, areas of concentration, and the courses therein follow.

Foundation Electives within Boston-Bouvé College
62.870 Philosophies in Physical Education
62.872 Comparative Physical Education
66.874 Seminar in Issues and Trends in Health and Physical Education
66.886 Critical Thinking in Health, Physical Education and Recreation

66.899 Seminar/Workshop
66.901 Health Issues: Implications for Education
66.904 Contemporary World Health
66.905 Environmental Health
66.906 Consumer Health

Areas of Concentration

Area I — Administration and Supervision
62.810 Administration of Physical Education and Athletics
66.814 Supervision of Professional Personnel
62.822 Problems in Contemporary Athletics for Men and Women
66.805 Planning and Developing Facilities for Physical Education and Recreation

Area II — Curriculum and Instruction
62.830 Curriculum Development in Physical Education
62.833 Applied Evaluation in Curriculum and Instruction
62.835 Seminar in Curriculum and Instruction
62.840 Advances in Instructional Concepts
62.842 Physical Education for Students with Special Needs
62.884 Movement and the Learning Process

Area III — Development and Learning in Movement and Perception
62.842 Physical Education for Students with Special Needs
62.860 Early Childhood Movement Patterns
62.864 Perceptual Motor Development
62.884 Movement and the Learning Process
66.894 Independent Study
Selected Interdisciplinary Courses or Movement Education Laboratory

Area IV — Sports Medicine (non-clinical)
62.851 Anatomic Kinesiology
62.852 Mechanical Analysis of Sport
62.854 Physical Fitness Appraisal and Guidance
62.857 Trauma Diagnosis and Treatment in Sport
62.859 Rehabilitation from Injury in Sport
62.880 Sociology of Sport
62.882 Psychology of Coaching and Sport

Area V — Health Education
62.830 Curriculum Development
62.833 Applied Evaluation in Curriculum and Instruction
62.835 Seminar in Curriculum and Instruction
62.840 Advances in Instructional Concepts
66.902 Toward Accountable Health Curriculum
66.903 Teaching Strategies: School and Community Health Education

Specialization in Recreation Education

To specialize in Recreation Education, four quarter hours of departmental course work are required. Each candidate is registered for either 63.812, Seminar in Contemporary Issues and Problems in Recreation Services or 63.830, Advanced Organization and Administration of Recreation Services. In addition, seven courses (28 quarter hours) appropriate to the student's needs and professional objectives are selected from the following list:

Community Recreation
63.834 Programs in Recreation
63.840 Politics and Bureaucracy in Recreation
63.842 Recreation and the Community School — Concepts and Practices
63.844 Leisure and Delinquent Behavior
63.805 Program Evaluation in Recreation

Therapeutic Recreation
63.850 Therapeutic Recreation Services for Special Populations
63.852 Seminar on Programming in Therapeutic Recreation
63.854 Observation of Recreation Services in Treatment Settings

Outdoor Education
63.824 School Camping
63.826 Administration of Resident Camp Programs

General Recreation Courses
63.813 Practicum in Clinical Recreation
63.816 Budgeting Systems
63.836 Public Relations in Recreation Agencies
66.805 Planning and Developing Facilities for Physical Education and Recreation
66.894 Independent Study
Selected Interdisciplinary Courses

courses

DESCRIPTION OF COURSES

All courses carry four quarter hours of credit unless otherwise indicated. Please see the current brochure for summer, fall, winter, and spring quarter course offerings.

PHYSICAL EDUCATION

62.810 Administration of Physical Education and Athletics
Physical education and athletics discussed as an entity consistent with the current emphasis on unity, economy, and equal opportunity. Modern practices and principles of general administration applied to problems of staffing, scheduling, budgeting, collective bargaining, personnel welfare, program development, and public relations. All levels of education and the broad spectrum of programs common to physical education and athletics are considered.

62.822 Problems in Contemporary Athletics for Men and Women
Current problems, practices, and national issues pertinent to the conduct of athletic competition. National, state, and conference organizations are studied.

62.830 Curriculum Development in Physical Education
The foundations of curriculum theory, research, practice, and evaluation in American education with specific application to health and physical education. Emphasis is placed on the processes of curriculum design and implementation in school settings.

62.833 Applied Evaluation in Curriculum and Instruction
Application of current educational evaluation theory to concepts of instruction and curriculum development in health and physical education. Includes formative and summative measures applied to the improvement of instruction, assessment of process and product in the educational program, interaction analysis. *Prep. 62.830 or 66.902.*

62.835 Seminar in Curriculum and Instruction
Problems of special interest in instructional theory, curriculum theory, and applied evaluation theory. Practical papers and class presentations emphasize scholarship in the solution of problems or issues in health, physical education, or recreation. *Prep. one course from the Curriculum and Instruction concentration in health or physical education; or, 63.834.*

62.840 Advances in Instructional Concepts
Current practices in and a search for new approaches to instruction in physical education. Includes analysis of teaching and learning styles, available instructional technology and the implementation of instructional designs in health and physical education classes.

62.842 Physical Education for Students with Special Needs
Assessment, planning, instruction and evaluation practices recommended for work with special needs in physical education classes. The role of the physical educator in the resource program is explored.

62.851 Anatomic Kinesiology
A study of the human musculo-skeletal system and its relationship to human movement patterns. Electromyography is used in assessing muscle-movement relationships. Current electromyographic research and techniques are investigated.

62.852 Mechanical Analysis of Sport
Application of mechanics of motion to the analysis of human motion. Emphasis is placed on cinematography and film analysis procedures in teaching and research. *Prep. 62.851, Anatomic Kinesiology or permission of instructor.*

62.854 Physical Fitness Appraisal and Guidance
Physical fitness screening tests and procedures, developmental and rehabilitation programs, fitness-producing activities, and current trends in testing and research. *Prep. Exercise Physiology and Measurement and Evaluation, or permission of instructor.*

62.857 Trauma Diagnosis and Treatment in Sport
An investigation of injury pathology, evaluative testing, diagnosis, and appropriate treatment modalities. *Prep. undergraduate Athletic Training or experience.*

62.859 Rehabilitation from Injury in Sport
Rehabilitation procedures and techniques appropriate to the post-injury retraining of athletes. *Prep. Adapted Physical Education or permission of instructor.*

62.860 Early Childhood Motor Patterns
The sequential development of fundamental motor patterns from age zero to 10 years. How to observe youngsters in a movement situation and assess their motor patterns is studied.

62.864 Perceptual-Motor Development
An overview of major theories of learning and perception as they apply to learning and refining motor skills. The interrelationships of movement behavior and perceptual-motor organization of vision, audition, proprioception, kinesthesis, and psycho-social effects are studied.

62.870 Philosophies in Physical Education
An exploration of major philosophies, past and present, and their influence on modern physical education. The student delineates his personal philosophy, explores philosophical analysis as a research technique, and reviews philosophical research. *Prep. Philosophy, Philosophy of Education, or permission of instructor.*

62.872 Comparative Physical Education
Both past and present philosophies and practices of national and international programs in physical education are compared. Historical analysis is introduced as a research technique.

62.880 Sociology of Sport
An analysis of the sociological principles and factors operative in the interaction between sport and society. Pertinent literature and research are reviewed. *Prep. General Sociology or permission of instructor.*

62.882 Psychology of Coaching and Sport
The psychodynamics of the athlete and the coach with particular reference to personality, maturation, motivation, learning, emotions, and perception. Individualized projects are required. *Prep. General Psychology or permission of instructor.*

62.884 Movement and the Learning Process
Major theories and research in learning and their application to learning motor skills. Perceptual-motor development and learning are examined; the programs evolving in this area and their implications for the teaching-learning process of motor skills are presented. *Prep. Educational Psychology or permission of instructor.*

RECREATION EDUCATION

63.805 Program Evaluation in Recreation
Comprehensive systems for evaluating program effectiveness studied as they relate to the consumer of recreation services. Major emphasis placed on developing an evaluation system for an agency of your choice. Case studies are drawn from the public, non profit and commercial sectors.

63.812 Seminar in Contemporary Issues and Problems in Recreation Services
Discussion of national and international issues, current trends, and contemporary problems as they affect recreation services.

63.813 Practicum on Clinical Recreation
A minimum of sixty (60) clock hours of supervised clinical experience, required of those students who do not have a degree in Recreation. Students are assigned to institutions that offer services in the area of therapeutic recreation and rehabilitation, community and municipal recreation, or outdoor recreation-education.
Waiving of such requirement may be granted, dependent on the student's background and experience. *Permission of adviser.*

63.816 Budgeting Systems
The rational and political aspects of budgeting studies as they relate to program analysis and policy formulation. Case studies are drawn from the public, non-profit, and commercial sectors.

63.824 School Camping
An independent study of the nature and conduct of outdoor recreation education as implemented in school camping programs. Problems investigated and methods developed under supervision of the faculty adviser and staff.

63.826 Administration of Resident Camp Programs
An in-depth study of staffing, sanitation and health; purchasing and storage of food, materials, equipment, and supplies; kitchen management; insurance, construction, and maintenance of buildings; and program areas as they affect resident camping programs. A study of nationwide goals and trends in the camping movement is included.

63.830 Advanced Organization and Administration of Recreation Services
Patterns for the implementation of recreation service by school systems, voluntary agencies, national service organizations, municipal governments, and state and Federal agencies investigated in depth.

63.834 Programs in Recreation
An examination and evaluation of program content, leadership, administration, and facilities in recreation service, sponsored under public, private, religious, industrial, and voluntary auspices.

63.836 Public Relations for Recreation Agencies
The central purpose of public relations is to influence public opinion. This course focuses on practical and ethical aspects of public relations for recreation agencies. Case studies are drawn from the public, nonprofit and commercial sectors.

63.840 Politics and Bureaucracy in Recreation
Practical problems faced by recreation professionals in public service are

investigated. Students study relationships between elected officials, bureaucrats, peers, subordinates, and supervisors in state and local governments.

63.842 Recreation and the Community School—Concepts and Practices
The role of recreation studied as an integral part of programming for the community school. An analysis of the community school concept with regard to philosophy, physical plant requirements, personnel, finance, and community involvement.

63.844 Leisure and Delinquent Behavior
Recreation studied as an intervention strategy to prevent and rehabilitate delinquent behavior.

63.850 Therapeutic Recreation Services for Special Populations
A survey of the types of therapeutic recreation services. The type, nature, cause, and prognosis of different abnormalities are studied and the impact of the disabilities on the individual, his family and community, and the role of therapeutic recreation in general.

63.852 Seminar on Programming in Therapeutic Recreation
Principles, leadership and programs in therapeutic recreation for individuals with disabilities and handicapping conditions. Emphasis on choice, adaptation, and implementation of appropriate activities. *Prep. either 63.850 or 63.854.*

63.854 Observations of Therapeutic Recreation in Treatment Settings
Guided observation sessions under professional supervision in various clinical settings. Group seminars are held to familiarize students as to the role of the rehabilitation team. *Prep. 63.850 or by permission of the instructor.*

INTERDEPARTMENTAL COURSES

50.841 Introduction to Educational Statistics
Basic statistical techniques such as measures of central tendency, variability, probability, correlation and regression, chi square, t test, and analysis of variance are covered. This course is conducted by the Graduate School of Education in the College of Education.

66.802 Research Design and Methodology
Research methods and designs used in health education, physical education, and recreation education. Emphasis is placed on the development of competence in research techniques including the ability to: define research problems; write hypotheses; review and interpret literature; apply research designs; organize, analyze and present data; and draw relevant conclusions. *Prep. 50.841 or permission of instructor.*

66.805 Planning and Developing Facilities for Physical Education and Recreation
The principles, terminology and standards for planning, construction and use of indoor and outdoor facilities for physical education and recreation. Integrated planning among all municipal departments is stressed.

66.814 Supervision of Professional Personnel
A study of modern personnel management as applied to staff in health, physical education, and recreation. Emphasis on task analysis, personnel, maturity for the task, leadership, and evaluative techniques.

66.874 Seminar in Issues and Trends in Health Education and Physical Education
Analysis of current issues and trends in education with special attention to health and physical education, with emphasis on systematic and practical solutions, resolutions, and adaptations.

66.886 Critical Thinking and Evaluation in Health Education, Physical Education and Recreation Education
Investigation of the acquisition of knowledge in the three disciplines. Examination of the evaluation of knowledge and practice through experiences in decision-making, logical analysis, and critical thinking. Methods of evaluation research are introduced.

66.890 Thesis/Project I
Initiation of a scholarly investigation under the auspices of the appropriate department. A written research proposal submitted to and approved by the student's thesis committee. *A student must have the permission of his program adviser before registering for this course.*

66.891 Thesis/Project II
The investigation proposed in Thesis I implemented with and culminated in an approved written report in thesis form. In partial fulfillment of this requirement, the student attends a series of research seminars. Upon completion, the candidate presents his thesis/project orally before the College seminar group. *Eight quarter hours for Thesis/Project I and Thesis/Project II.*

66.894 Independent Study
Under the guidance and direction of his program adviser, each student develops and conducts a project related to his professional interest which includes: a statement of problem or purpose, hypothesis, an exhaustive review of literature, an appropriate research design, a standard investigating instrument or one of his own design, a small sample of the population subjected to investigation, presentation and discussion of results, and a statement of conclusions. The project is reported in thesis format when appropriate. (Credit arranged with program adviser.) *Prep. permission of program adviser.*

66.899 Seminar/Workshop
The College offers a special seminar or workshop from time to time in health, physical education, physical therapy, or recreation. Graduate credit may be granted for successful completion of a workshop, but credit may not be applied toward a degree program without the approval of the program adviser. All participants must be degree candidates in the Boston-Bouvé Graduate Program or must qualify, prior to registration, as special graduate students. Credit of one, two, three, or four quarter hours is determined by the workshop director. *Prep. permission of workshop director.*

66.901 Health Issues: Implications for Education
Identification and analysis of today's critical health issues. Increased educational involvement to fill the gap between current health knowledge and overt behavior.

66.902 Toward Accountable Health Curriculum
Exploration, assessment, and analysis of the professional team and selected health curriculum. Involvement of current educational philosophy to strengthen the ultimate goal of producing humane individuals by accountable health curriculum.

66.903 Teaching Strategies: School and Community Health Education
Essential contemporary strategies for achieving a humanizing base to reduce the time lag between relevant health information, action, values, and the modification of health behavior regarding school and community health education. Selected student projects in developing models for personal concerns.

66.904 Contemporary World Health
A survey of the state of the world's health, the progress which has been made, and the difficulties yet to be overcome. The importance of "partners in health," as compared to the solitary research worker, in reaching the current health needs. The contributions of WHO, UNESCO, UNICEF, and FAO.

66.905 Environmental Health
The study of some of the most serious problems facing mankind as people continue to pollute and ravage the environment. Student involvement in selected problem areas associated with air, water, and noise pollution; solid waste accumulation; and the use of pesticides and other pollutants.

66.906 Consumer Health
Analysis and evaluation of the concepts concerned with the careful selection of health products and services. Decision making relative to the selection of health products and services; evaluating advertising; quackery; protection against useless or dangerous products through consumer organizations as areas for student exploration and study projects.

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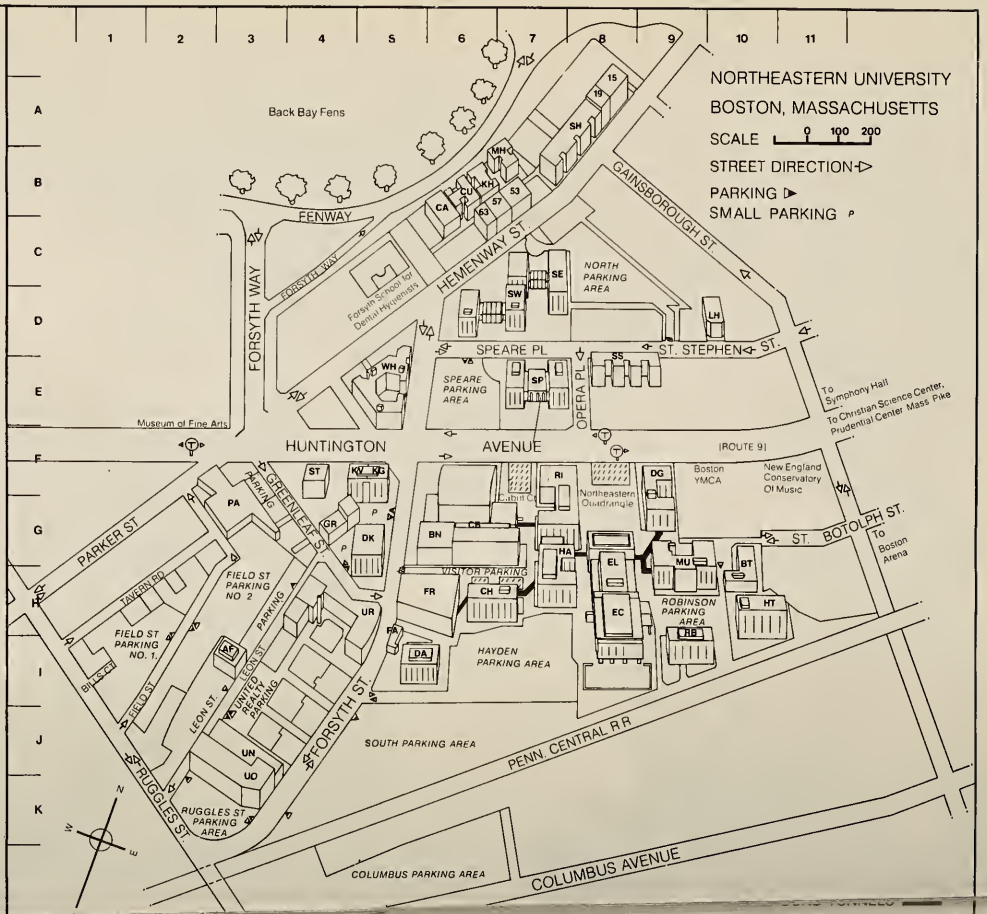
Academic and Service Buildings	Map Code	Bldg. Code
African-American Institute	I3	AF
Barletta Natatorium	G6	BN
Botolph Building	G10	BT
Cabot Physical Education Center	G6	CB
Cahners Hall	C6	CA
Churchill Hall	H6	CH
Cooperative Education Building	F4	ST
Cushing Hall	B6	CU
Dana Research Center	I5	DA
Dockser Hall	G5	DK
Dodge Library	G9	DG
Ell Student Center (Auditorium section)	G8	EL
Ell Student Center (Student Lounge section)	H8	EC
Forsyth Building	H6	FR
Forsyth Building Annex	H5	FA
Greenleaf Building	G4	GR
Hayden Hall	G7	HA
Hurtig Hall	H11	HT
Kerr Hall (Faculty Center)	B6	KH
Knowles Center (Gryzmish Hall section)	F5	KG
Knowles Center (Volpe Hall section)	F5	KV
11 Leon Street	J3	UO
15 Leon Street	J3	UN
Mugar Life Sciences Building	G9	MU
Parker Building	G3	PA
Richards Hall	F7	RI
Robinson Hall	H10	RB
United Realty Building	H5	UR
Dormitories		
115 Hemenway Street	A8	15
119 Hemenway Street	A8	19
153 Hemenway Street	B7	53
157 Hemenway Street	B6	57
163 Hemenway Street	C6	63
Kerr Hall	B6	KH
Light Hall	D10	LH
Melvin Hall	B7	MH
106-122 St. Stephen Street	E8	SS
Smith Hall	B8	SH
Speare Hall	E7	SP
Stetson Hall East	C7	SE
Stetson Hall West	D7	SW
White Hall	E5	WH



ACADEMIC CALENDAR 1976—1977

Fall Quarter 1976

Registration period		
Burlington	Tuesday—Wednesday	Sept. 14—15
Boston	Monday—Thursday	Sept. 20—23
Classes begin	Monday	Sept. 27
Examination period	Monday—Saturday	Dec. 13—18

Winter Quarter 1976—1977

Registration period		
Burlington	Tuesday	Nov. 30
Boston	Monday—Thursday	Dec. 6—9
Classes begin	Monday	Jan. 3
Examination period	Monday—Saturday	Mar. 21—26

Spring Quarter 1977

Registration period		
Burlington	Tuesday	Mar. 8
Boston	Monday—Thursday	Mar. 14—17
Classes begin	Monday	Apr. 4
Last day to file card for		
Spring Commencement	Friday	Apr. 1
Last day to pay fee for		
Spring Commencement	Friday	Apr. 29
Final grades due in Registrar's		
Office for June graduates	Friday	June 3
Examination period	Monday—Saturday	June 13—18
Spring Commencement	Sunday	June 19

Summer Quarter 1977

Registration period		
Burlington	Monday—Tuesday	June 13—14
Boston	Wednesday—Thursday	June 15—16
Classes begin	Monday	June 27
Last day to file card for		
Fall Commencement	Friday	July 1
Last day to pay fee for		
Fall Commencement	Monday	Aug. 1
Examination period	Wednesday—Thursday	Aug. 3—4

UNIVERSITY HOLIDAYS 1976—1977

Columbus Day	Monday	October 11
Veterans' Day	Thursday	November 11
Thanksgiving Recess	Thursday—Saturday	November 25—27
Christmas Vacation	Monday—Saturday	Dec. 20—Jan. 1
Martin Luther King Day	Saturday	January 15
Washington's Birthday	Monday	February 21
Patriot's Day	Monday	April 18
Memorial Day	Monday	May 30
Independence Day	Monday	July 4
Labor Day	Monday	September 5

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admissions, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or on the basis of being a handicapped but otherwise qualified individual. In addition, Northeastern takes affirmative action in the recruitment of students and employees. Inquiries concerning our equal opportunity policies may be referred to the University Affirmative Action Officer and/or the Title IX coordinator.

Delivery of Services

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the University, which causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements and acts of public authorities. The University will, however, exert reasonable efforts, when in its judgment it is appropriate to do so, to provide comparable or substantially equivalent services, facilities or performance, but its inability or failure to do so shall not subject it to liability.

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the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of nearly 180 distinguished business and professional men and women.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922); Liberal Arts (1935); Education (1953); Pharmacy (1962); Nursing (1964); Boston-Bouvé College (1964); the College of Criminal Justice (1967); and by Lincoln College's daytime Bachelor of Engineering Technology program (1971). This educational method enables students to gain valuable practical experience as an integral part of their college program and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, actuarial science, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. University College offers evening courses — offered by the University since 1906 — and adult-day courses leading to the bachelor's degree. In addition to offering day undergraduate programs in Electrical Engineering Technology and Mechanical Engineering Technology, Lincoln College offers evening/part-time certificate, associate, and bachelor degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the Basic College faculties concerned.

GRADUATE AND PROFESSIONAL SCHOOLS

The ten graduate and professional schools of the University offer day and evening programs leading to the degrees listed.

The Graduate School of Actuarial Science offers the degree of Master of Science in Actuarial Science.

The Graduate School of Arts and Sciences offers the degrees of Master of Arts, Master of Science, Master of Science in Health Science, Master of Public Administration, and Doctor of Philosophy.

The Graduate School of Boston-Bouvé College offers the degree of Master of Science, with specialization in Physical Education or Recreation Education.

The Graduate School of Business Administration offers the degrees of Master of Business Administration and Master of Science in Professional Accounting.

The Graduate Program in Criminal Justice offers the degree of Master of Science.

The Graduate School of Education offers the degrees of Master of Education, Doctor of Education, and the Certificate of Advanced Graduate Study.

The Graduate School of Engineering offers the degrees of Master of Science, Engineer degree, Doctor of Engineering, and Doctor of Philosophy.

The School of Law offers the degree of Juris Doctor.

The Graduate School of Pharmacy and Allied Health Professions offers the degrees of Master of Science and Doctor of Philosophy.

The Graduate School of Professional Accounting offers the degree of Master of Science in Accounting.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established in 1960 to relate the University to the needs of its community in a period of accelerated change. Adult education programs offered by the Center and University College have since been consolidated. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

RESEARCH ACTIVITIES

The facilities of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning take place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

buildings and facilities

MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, the Boston Public Library, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 48 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

Ell Student Center

The Carl S. Ell Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

Libraries

The University library system consists of the Dodge Library, which is the main library; the Suburban Campus Library at Burlington; the School of Law Library; and divisional libraries for Physics and Electrical Engineering, Chemistry and Biology, Mathematics and Psychology, and Health, Physical and Recreation Education, and Physical Therapy. There are additional subject collections for the Center for Management Development at Andover, Massachusetts, and the Marine Science Institute in Nahant.

The library collections number 400,000 volumes supplemented by some 333,000 titles in microprint, microfilm, and microfiche forms. The collection includes, in addition, some 3,700 periodical titles, 100,000 documents, and 4,600 sound recordings.

Cabot Physical Education Center

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. The large gymnasium contains four basketball courts. In addition, the Center consists of an athletic cage, a small gymnasium, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouvé College.

A recent addition to the Center, the Barletta Natatorium, houses a 105-foot swimming pool, a practice tank for the crew, handball courts, and shower and dressing facilities.

Dockser Hall

Charles and Estelle Dockser Hall, completed in 1968, houses a large gymnasium, dance studio, motor performance laboratory, college library, community recreation laboratory, folk arts center, dark and music rooms, recreation resources area, locker rooms, offices, classrooms, conference room and lounge, storage facilities, and a research laboratory.

SUBURBAN FACILITIES

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, sciences, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

Warren Center

The Warren Center is a practical laboratory for Boston-Bouvé College in outdoor education and conservation, in group practicum, and in camping administration, programming, and counseling. At this Center in Ashland, completed in 1967, there are tennis courts, field hockey and lacrosse fields, waterfront for swimming and boating, overnight camp sites, fields and forests, heated cottages, the Hayden Lodge with a recreation hall, library, crafts shop, dining facilities, and conference accommodations.

Henderson House

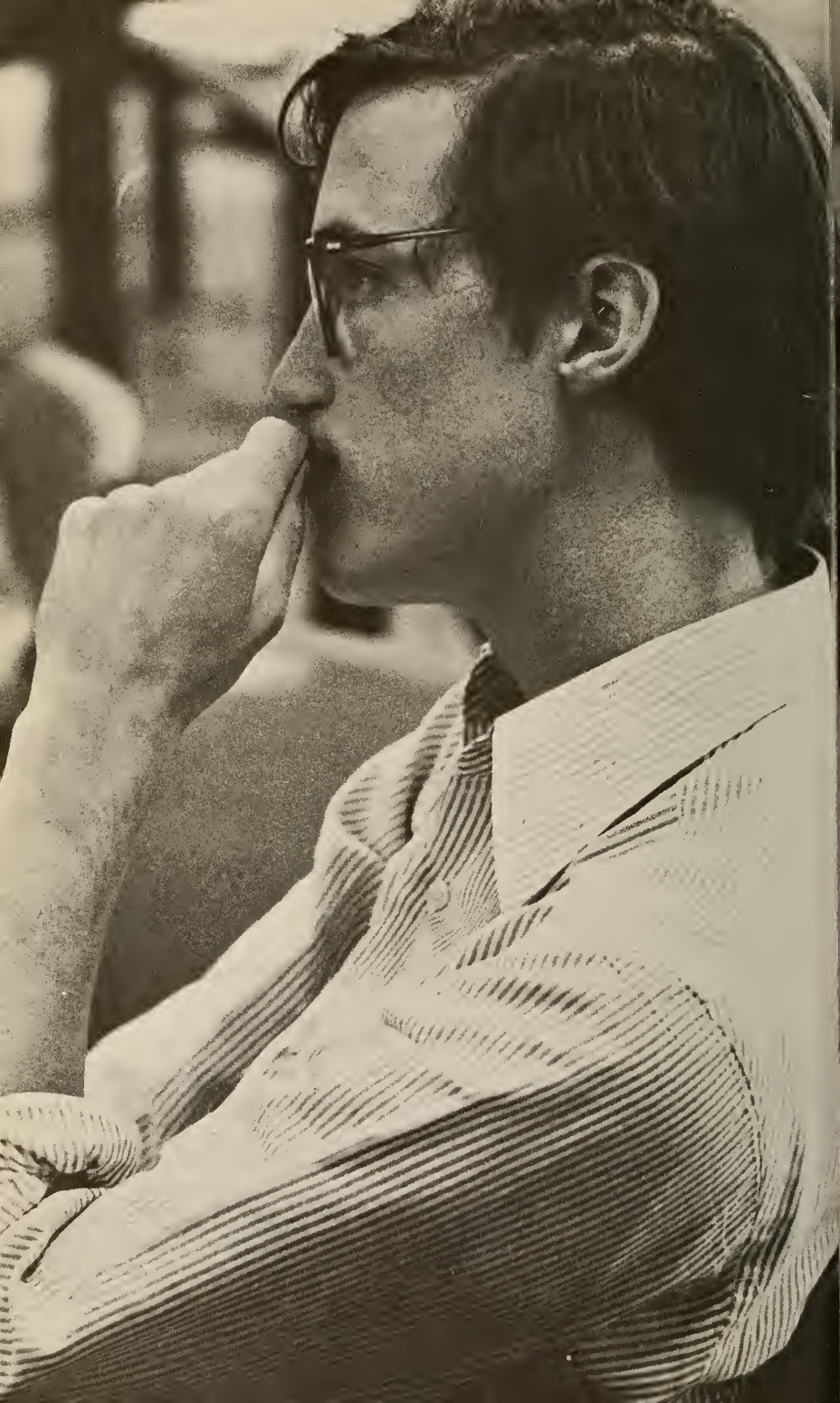
The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

Marine Science Institute

The Marine Science Institute at Nahant, Massachusetts, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated all year, and is located about 20 miles northeast of Boston. Many of the courses at this Institute are applicable toward an advanced degree in biology or health science.

Nashua Campus

Students residing in the Southern New Hampshire area may take a significant portion of the M.B.A. Program at facilities in Nashua, New Hampshire. These facilities, made available by Sanders Associates, Inc., are located in the company's headquarters on Route 3, just over the Massachusetts line.



graduate school of business administration

The Graduate School of Business Administration at Northeastern University offers a program leading to the degree of Master of Business Administration. Broad in concept, the program is aimed at preparing the student for a career in administration rather than for an immediate or particular position. The curriculum and teaching methods center around the development of basic skills and knowledge appropriate to administration, rather than emphasizing specialized functional techniques. Although the case method of study is used extensively, a variety of teaching methods is employed that is consonant with particular course objectives. The basic objectives of the program are to increase skills and knowledge in basic disciplines underlying administrative practice, and to develop judgement and skills of problem analysis and decision making in complex organizations.

There is no prescribed undergraduate background recommended for admission. Undergraduate experiences typically include literature and the arts, mathematics and the sciences, and engineering and other applied fields. The program provides all managerial preparation appropriate to a graduate business curriculum. Flexibility allows for more intensive work in a specialized area or more general study in several fields to accommodate specific needs.

The student may choose one of three methods of securing an M.B.A. degree: internship, full-time, and part-time study.

Internship

A feature which makes this Northeastern M.B.A. Program unusual in graduate education is the incorporation of a formalized work experience.

The 18-month program is in accordance with the Northeastern philosophy that a balanced exposure to theory and practice is the most effective approach to education. Class work begins with basic disciplines vital to sound progress in a management-oriented course. The functional areas of business are treated next, with process courses and electives following.

The Management Intern Program incorporates six months of full-time work experience in the world of business and 12 months of full-time classroom study. The intern student, after completing one-half of the required M.B.A. course work, is employed in a capacity which provides both a realistic professional experience and an added source of funds for continuance in the program. The nature of the job assures ample opportunity to apply concepts learned in the classroom and to test the realities of career options.

Because of economic, academic, and individual variables, the Graduate School does not guarantee placement; however, the University has full-time, experienced staff to assist the student in obtaining the internship. Students are also encouraged to investigate employment opportunities on their own in order to facilitate final placement by the intern coordinator.

Students are admitted as full-time interns in January and June of each year. The sequence of class and work sessions is illustrated below for both of these classes.

	1st year				*2nd year*			
	Summer	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**
June class	Class	Class	Work	Work	Class	Class		
January class			Class	Class	Work	Work	Class	Class

During each academic quarter the student normally carries 18 quarter hours of credit.

Thus, the full-time internship blends one full calendar year of academic study with six months of coordinated work in a business, industrial or non-profit setting. This combination of theory and practice gives the intern excellent preparation for a career in management.

Full-Time

The full-time, non-internship allows students wide latitude in determining their pace toward the M.B.A. degree. Although most students take four courses each quarter, some take as many as five or six courses. This enables a candidate to complete degree requirements in a period from one calendar year to two academic years.

Part-Time

Part-time students may continue their full-time employment while acquiring the background, skills, and knowledge that will help them advance their careers in administration.

These students normally take two courses per quarter; classes are scheduled so that part-time candidates may attend both courses on the same night. Therefore it is possible for a student to complete the degree program in three to four years, depending upon whether course work is taken during the summer quarter. All courses registered for the M.B.A. may be completed at the Boston or Burlington campuses.

Students maintaining a satisfactory academic standing may petition the Director of the Graduate School of Business Administration for permission to take more than two courses per quarter.

Thus, part-time students have the advantage of attending classes in the late afternoon and evening to learn the theory behind the practical application of their employment.

APPLICATION INFORMATION AND PROCEDURE

All applicants should address inquiries to the Graduate School of Business Administration. Application forms and reference blanks will be mailed to them. This material, together with one official undergraduate transcript, the Graduate Management Admission Test (GMAT) scores, and the results of the Test of English as a Foreign Language (TOEFL, required by all applicants whose native language is not English), should be returned to:

Northeastern University
Graduate School of Business Administration
224 Hayden Hall
Boston, Massachusetts 02115

Applications for the GMAT Examination can be obtained by writing to:

Educational Testing Service
Box 966
Princeton, New Jersey 08540

Applications for the TOEFL Examination can be obtained by writing to:

Educational Testing Service
Box 899
Princeton, New Jersey 08540

DEADLINES FOR APPLICATION

Class	Full-Time Deadline	Classes Begin
Intern	October 15th	January 3, 1977
Assistantship	March 15th	September 20, 1977
Intern	April 1st	June 27, 1977
Full-Time	April 1st	September 26, 1977

Class	Part-Time Deadline	Classes Begin
Winter	November 1st	January 3, 1977
Spring	February 15th	April 4, 1977
Summer	May 15th	June 27, 1977
Fall	August 15th	September 26, 1977

To be admitted for graduate work in the College of Business Administration, applicants must have completed undergraduate work of high quality and must have obtained a bachelor's degree from a recognized institution of higher learning. The overall quality of undergraduate achievement is considered to be of more importance than the particular field of specialization. Official transcripts of all previous undergraduate and graduate work

must be submitted to the Graduate School of Business Administration before admission can be considered or an evaluation made.

Personal interviews may be required for entrance to the management intern program. Applicants will be invited to the Boston campus for an interview after all application material has been received.

Due to the rolling admissions policy of the Graduate School, applicants for the January intern program will not be granted interviews until July of the preceding year. Final decisions for the January class will be made beginning in August.

The basic criteria considered in the admissions procedure are: undergraduate grades, previous graduate work, the score on the GMAT, job experience, and present job level. An overall impression of strength, past success, and motivation to succeed in the Graduate School is sought in the applicants for the program.

Although the M.B.A. Program presumes no particular level of competence in the areas of accounting, economics, statistics, mathematics, and behavioral science, prospective applicants are advised to acquire some background in these areas in their undergraduate work.

GENERAL REGULATIONS

The general regulations and minimum requirements for all graduate programs are established by the Northeastern University Graduate Council. In some matters the committee of each graduate school is allowed discretion to establish regulations within limits defined by the Council. The regulations and academic requirements which follow have been formulated in accordance with this general policy.

Academic Requirements

In order to qualify for the M.B.A. degree, an average grade of B must be obtained in the total credit hours required for graduation. No more than three extra courses or repeated courses may be taken in order to satisfy this grade requirement.

Any student who receives a grade of less than B in four or more degree credit courses may be withdrawn from the program by action of the Committee of the Graduate School of Business Administration.

Within the above limitations, a required course for which a grade of I or F is received must be repeated with a grade of C or better, and may be repeated only once. If a grade of I or F is received in an elective course, that course may be repeated once with a grade of C or better, or another elective course may be substituted for it. If a grade of C is received in a required course, that course may be repeated once to obtain a grade of B or better.

The continuing development of the Graduate School forces frequent revision of curricula. In every new bulletin some revisions are indicated. When no hardship is imposed on the student because of changes, and when the facilities of the school permit, the student is expected to meet the requirements of the latest bulletin.

Application for the Degree

A commencement card must be filed with the Registrar's Office before the date specified on the University calendar. This assures the student's graduation the same year all degree requirements are completed. Prompt filing of the commencement card also ensures the correct spelling on the diploma.

Continuity of Program

Students are expected to maintain continuous progress toward a degree. Any student who does not attend Northeastern for a period of one quarter without notifying the program director will be classified as inactive.

All inactive students must submit a written petition to the director of the program in order to be readmitted to graduate study. Petition forms may be obtained in Room 224 Hayden Hall.

Credits and Class Hours

All credits at Northeastern University are entered as quarter-hour credits, with a quarter hour of credit being equivalent to three fourths of a semester hour: i.e., 12 semester hours equal 15 quarter hours.

All classes in the Graduate School of Business Administration meet on a quarter basis, with an academic quarter defined as a term of approximately 12 weeks' duration. In the summer quarter, classes meet in two six-week sessions. The academic calendar at the front of this bulletin should be consulted to determine the opening dates of each quarter.

A minimum of 11 classes must be scheduled for each course during the fall, winter, and spring quarters. In a split summer session (5 and 6 weeks), a minimum of 10 classes must be scheduled in the first 5 weeks and a minimum of 11 classes in the second 6 weeks.

Grading System

The performance of students in graduate courses will be recorded by the instructor through use of the following grades:

A *Excellent*
This grade is given to those students whose performance in the course has been of very high graduate caliber.

B *Satisfactory*
This grade is given to those students whose performance in the course has been at a satisfactory level.

C *Fair*
This grade is given to those students whose performance in the course is not at the level expected in graduate work.

F *Failure*
This grade is given to those students whose performance in the course is unsatisfactory.

In addition, the following letter designations are used:

I *Incomplete*
This grade is given to those students who fail to complete the work of the course.

The designation I will be changed to a grade upon removal of the deficiencies which caused the grade of I to be reported. Deficiencies must be made up within the quarter following that for which the grade of I is received, unless the instructor grants an extension of time. However, such extension may not exceed two additional consecutive calendar quarters.

Registration

Part-time students must register during the periods listed on the school calendar. Dates of registration are specified by letter for students accepted for full-time study.

Residence

All work for advanced degrees must be completed in residence at the University, unless approval has been obtained from the Director of the Graduate School of Business Administration for work taken elsewhere. Students who are in residence and are using the facilities of the University must register for such work.

Time Limitation

Course credits earned in the program of graduate study, or accepted by transfer, are valid for a maximum of seven years.

Transfer Credit

A maximum of 15 quarter hours of graduate credit obtained at another institution may be accepted toward the master's degree, provided that the credits transferred carry grades of A or B, have been earned at a recognized institution, have not been used toward any other degree, and are relevant to the M.B.A. Program. Students should petition the Graduate School of Business Administration in writing for all transfer credit. Petition forms may be obtained in Room 224 Hayden Hall. Grades on transfer courses are excluded in the computation of the academic average necessary for the completion of the degree requirements.

Waiver Procedures

Students with strong academic achievement in a specific course area may petition to waive required courses in that area. Although all petitions for course waiver must be initiated through the Graduate School office, each petition is subject to approval by the faculty within the particular academic area involved.

The faculty of each department has the authority to determine the adequacy of a student's background relative to the course material to be waived. Some departments may require examinations prior to waiver; others may dictate advanced electives to be taken in lieu of required courses successfully waived.

Generally several undergraduate courses in a specific area are required for a successful course waiver. The following guidelines also apply:

A. No undergraduate course can be considered toward waiver request unless it was taken at an accredited school.
B. No undergraduate course can be counted toward a waiver request unless a grade of "B" or better was received.
C. No student shall receive the M.B.A. degree unless at least 18 graduate courses are taken within the Northeastern University graduate program. Thus, the maximum number of courses which may be waived with credit is 10.

Petition forms and waiver guidelines may be obtained in the Graduate School office (224 HA).

Withdrawals

In order to withdraw from a course, a student must submit an official withdrawal form obtained at the Registrar's Office or at the Suburban Campus Main Office. Withdrawals may be made through the ninth class meeting of the quarter. Students are withdrawn as of the date on which they submit the form. Ceasing to attend a class or notifying the instructor does not constitute an official withdrawal.

Petitions for withdrawal from a course after the ninth class meeting of the quarter must be submitted to the Director of the Graduate School, and may be approved to avert unusual hardships on a student. Petition forms may be obtained in Room 224 Hayden Hall.

financial information

FINANCIAL OBLIGATIONS

Tuition

Tuition for master's degree candidates and special students is $66.00 per quarter hour of credit. Since each graduate course is three credit hours, the cost for each course is $198.00.

Tuition statements are mailed to students by the Bursar's Office and are payable by check to Northeastern University on or before the date specified. Tuition rates and fees are subject to revision by the Board of Trustees at any time.

Fees

All applications must be accompanied by an application fee (nonrefundable) of $25.00. No applications will be processed until the fee has been received by the Graduate School of Business Administration. Checks should be made payable to Northeastern University and sent directly to the Office of the Graduate School of Business Administration, 224 Hayden Hall.

Upon notification of admission, all full-time applicants are required to pay a tuition deposit of $100.00. Those accepted for part-time M.B.A. are required to pay a tuition deposit of $50. These deposits are credited to the student's tuition, and are not refundable for those who do not register.

Other fees include: a charge of $10.00 for late payment of tuition; and a fee of $25.00 for all degree candidates, payable before commencement by the applicable date listed on the academic calendar.

For full-time students there is a charge of $12.50 per quarter for the services available in the Student Center. The fee for tuition assistants, teaching assistants, and administrative assistants is $6.25 each quarter. All part-time students on the Huntington Avenue Campus are charged $.75 a quarter.

All full-time students will pay a nonrefundable University Health Services fee of $120.00 each year. This fee provides Blue Cross-Blue Shield coverage and entitles the student to the medical care furnished by the University Health Services.

All financial obligations to the University must be discharged before graduation.

Refunds

Tuition refunds are granted only on the basis of the date appearing on the official withdrawal form filed by the student. Nonattendance does not constitute official withdrawal. Questions regarding refunds should be discussed with the Bursar's Office.

Refunds will be granted in accordance with the following schedule:

Official Withdrawal Filed Within	*Percentage of Tuition Refunded*
First week of quarter	100
Second week of quarter	75
Third week of quarter	50
Fourth week of quarter	25

FINANCIAL AID

The Graduate School of Business Administration grants financial aid only in the form of Assistantships. (Internships are available as part of the intern program.) Other forms of financial aid are not handled by the Graduate School but by the office indicated below.

Assistantships

Students applying for the full-time M.B.A. Program are eligible to apply for the Graduate Assistantship Program. A separate Assistantship application must be filed with the Graduate School of Business Administration no later than March 15.

A full-time Assistantship enables students to pursue studies while serving in either (1) an administrative or (2) a teaching capacity within the College of Business Administration.

(1) Administrative Assistants assist staff or faculty in University administrative responsibilities. Positions available encompass functions in student counseling, college recruiting, curriculum scheduling, and application processing.

(2) Teaching Assistants are assigned duties in instructing classes, formulating and proctoring exams, and counseling students either in accounting, finance, marketing, statistics, or introduction to business.

Administrative and Teaching Assistants are expected to devote 20 hours per week to assigned duties. Appointments are made for each academic year, with full tuition remission, plus a stipend consisting of $3,000 in the first academic year, and $3,000 in the second. Tuition assistants are granted full tuition remission in return for 8 hours of service a week.

Applicants for the Teaching and Administrative Assistantships who are not selected for these awards will automatically receive consideration for a Tuition Assistantship with administrative or research responsibilities. (No additional application is required.)

Northeastern University, which is a member of the Council of Graduate Schools of the United States, subscribes to the following Resolution of the Council: "In every case in which a graduate assistantship, scholarship, or fellowship is offered to an actual or prospective graduate student, the student, if he indicates his acceptance before April 15, will have complete freedom through April 15 to submit in writing a resignation of his appointment in order to accept another graduate assistantship, scholarship, or

fellowship. However, an acceptance given or left in force after April 15 commits him not to accept another appointment without first obtaining formal release for the purpose."

Dormitory Proctorships

A number of proctorships in men's dormitories on or near the Huntington Avenue Campus is available each year. Appointments carry a minimum compensation of room and board. Further information and application forms may be obtained from the Office of University Housing.

Guaranteed Student Loan Program

Under this program, students who are matriculated degree candidates, enrolled for at least one-half the normal academic work load, may borrow from a participating bank or other financial institution. Terms and conditions vary from state to state, but a student generally may borrow up to $1,500 a year (the law allows a maximum of $2,500 per year) depending on financial need. The Federal government pays the interest while the student is in school if the student is eligible for interest subsidy.

The student must have submitted, through the College Scholarship Service, a Parents' Confidential Statement; or if he has been declared financially independent by the Financial Aid Office, a Students' Confidential Statement. These forms are available in the Financial Aid Office.

Applications for the loan itself are available from local banks or the Education Office of your state government. Additional information and necessary application forms for Massachusetts residents are available from the Financial Aid Office.

Martin Luther King, Jr., Fellowships

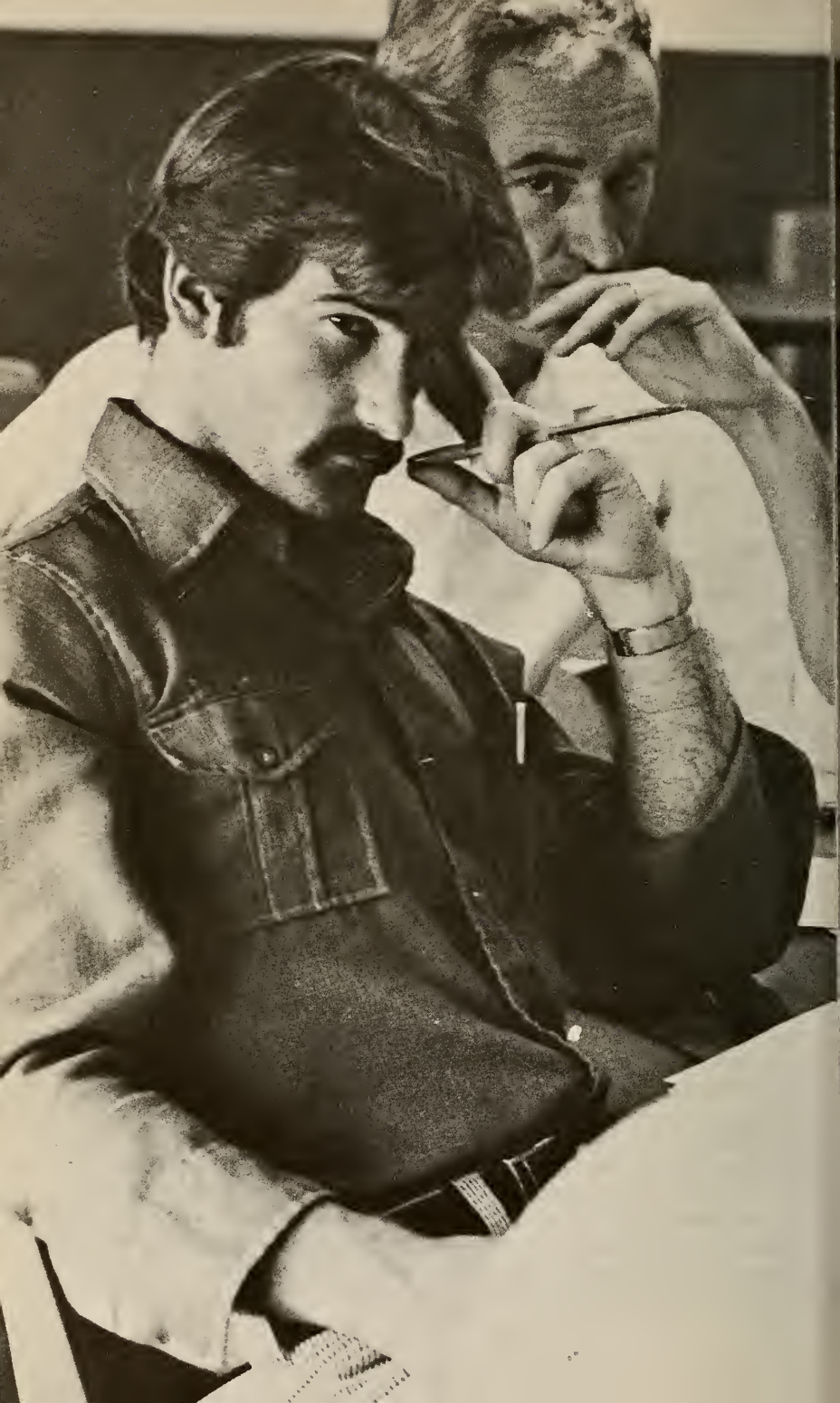
A limited number of full-time Martin Luther King, Jr., Fellowships are available. Holders of these appointments devote full time to graduate work. Further information is available at the African-American Institute.

National Direct Student Loan

This program is available to students who are carrying at least one-half the normal academic work load, are accepted as degree candidates, and who show evidence of financial need.

The Federal maximum which a graduate student may borrow while pursuing a post-baccalaureate degree is $5,000.

Repayment and interest on these loans do not begin until nine months after the student ceases to carry at least a half-time academic load at an institution of higher education. The repayment of principal may be extended over a 10-year period with the interest at the rate of three percent per annum. Repayment may be deferred up to a total of three years while a borrower is serving as a Peace Corps or VISTA volunteer.



faculty

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Robert J. Minichiello, *Professor of Marketing;* A.B., Harvard University; M.B.A., Boston University; D.B.A., Harvard University

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Andre P. Priem, *Associate Professor of Management; B.B.A., M.A., University of Cincinnati*

Paul C. Richards, *Lecturer in Business Adminstration;* B.S., M.B.A., Northeastern University; C.P.A.

Anghel N. Rugina, *Professor of Economics and Finance;* B.S., College of Business, Golatz, Rumania; M.A., Ph.D., Academy of High Studies in Economics, Bucharest, Rumania; Ph.D., University of Freiburg, Germany

Richard J. Santos, *Associate Dean and Director, Center for Management Development, and Associate Professor;* B.S., Salem State College; M.A., Emerson College

Daniel C. Scioletti, *Associate Professor of Business Law;* B.B.A., Colby College; LL.B., Suffolk University; Ed.M., Boston University

Charles Shelley, *Assistant Professor of Business Administration;* B.B.A., Ph.D., University of Massachusetts

Albert Slavin, *Lillian L. and Harry A. Cowan Professor of Accounting;* Ed.B., Ed.M., Boston University; C.P.A.

Francis C. Spital, *Assistant Professor of Business Administration;* M.A., University of Sussex, England; Ph.D. Candidate, Massachusette Institute of Technology

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Wayne W. Suojanen, *Assistant Professor of Business Administration;* B.A., Northwestern University; S.M., Massachusetts Institute of Technology; Ph.D. Candidate, Massachusetts Institute of Technology

Jeffrey A. Timmons, *Associate Professor of Management;* A.B., Colgate University; M.B.A., D.B.A., Harvard University

Edward R. Willett, *Professor of Finance;* B.S., Northeastern University; M.A., Ph.D., Harvard University

Frederick Wiseman, *Associate Professor of Marketing;* B.S., Tufts University; M.S., Ph.D., Cornell University

master of business administration curriculum

Candidates entering the M.B.A. Program after January 1, 1977 must satisfy the requirements for 28 graduate business courses.* Of these 28, there are 20 required courses and 8 electives. Those students entering the program with previous business education may apply for a maximum of 10 course waivers. However, most undergraduate business programs will qualify a candidate for no more than 4 to 6 waivers.

Required Courses

Number	*Courses*	*Credit Hours*
41.811	Financial and Managerial Accounting	3
41.812	Control I	3
41.813	Control II	3
43.811	Marketing Management I	3
43.812	Marketing Management II	3
44.811	Financial Management I	3
44.812	Financial Management II	3
45.805	Operations Management I	3
45.806	Operations Management II	3
45.815	Behavioral Concepts	3
45.816	Organizational Behavior I	3
45.817	Organizational Behavior II	3
45.834	Policy: Environmental Analysis	3
45.836	Policy: The Formulation of Strategy	3
45.837	Policy: The Implementation of Strategy	3
49.901	Managerial Economic Analysis I	3
49.902	Quantitative Analysis I	3
49.903	Quantitative Analysis II	3
49.909	Managerial Economic Analysis II	3
49.932	Introduction to Computer Applications	3
	Total Required Credit Hours	60
	Elective Credit Hours	24
	Total Credit Hours for Degree	84

Elective Courses

In addition to the required courses, students must complete course work in electives to bring their total program to the 84 quarter hours of credit required for the Master of Business Administration degree. All elective

*The January, 1977 Intern Class will follow the present 24 course curriculum.

courses carry three quarter hours of credit unless otherwise specified.

Courses may also be selected from other graduate programs at Northeastern University with the permission of the director of the appropriate program and the Director of the Graduate School of Business Administration.

The electives offered in the Graduate School of Business are continually being revised to conform to the interests of the Faculty and current student body. The courses listed below are representative in nature, having been offered during the last academic year.

Administration and Its Environments

39.823 Government Finance
39.825 Fiscal Policy
39.831 Money and Banking
39.835 Labor Economics
39.9H1 Economics of Medical Care and Health Manpower
41.821 Accounting Problems for Decision-Making
41.862 Tax Factors in Business Decisions
45.821 Policy Formation in Non-Business Institutions
45.840 Managerial Styles and Sex Stereotypes
45.841 Public/Private Service Systems
45.843 Environmental Pressures and the Multi-National Corporation
45.969 Government and Business
45.989 Science and Technology: The Challenge of Management
45.991 Business Law—Law of Contracts, Agency and Sales
45.992 Law of Business Organizations and Negotiable Instruments

Financial Management

44.814 International Financial Management
44.816 The Management of Financial Resources
44.818 Working Capital Management
44.901 Finance III—Advanced Financial Management
44.921 Investment Analysis
44.924 Mergers and Negotiable Instruments
44.935 Management of Financial Institutions

General Management

45.997 Special Topics in Business Administration (1 to 3 Q.H.)
45.998 Administration (1 to 3 Q.H.)
45.999 Administration (1 to 3 Q.H.)
49.932 Introduction to Computer Applications
49.933 The Computer and Its Applications II
49.935 Computer Applications in Management Science

Health Care Administration

21.840 Sociology of Medicine
39.9H1 Economics of Medical Care and Health Manpower
41.817 Fiscal Planning, Budgeting and Control of Health Care Institutions
45.833 Operations Management in the Health Care System
45.838 Policy Formation in Health Care
45.975 Introduction to Health Care Systems
45.976 Workers in the Health Care System
45.977 Information Systems for Health Care Facilities

International Business Management

39.833 International Economics
44.814 International Financial Management

Management of Human Resources

45.819 Interpersonal Behavior
45.820 Psychological Dynamics of Leadership
45.823 Career Planning and Development
45.824 Organizational Behavior in a Non-Profit Environment
45.835 Seminar in Organizational Development
45.951 Executive Development
45.971 Personnel Management
45.972 Labor Relations
45.985 Management of Research and Development
45.993 Labor Law

Management of Transportation and Logistics

48.801 Seminar in Inter-city Transportation
48.805 Urban Transportation
48.901 Physical Distribution Management

Managerial Control

41.815 Management Control Systems
41.816 Management Control of Health Service Systems
41.825 Management Performance Appraisal
41.862 Tax Factors in Business Decisions

Marketing Management

43.910 International Marketing
43.925 Sales Management
43.930 Statistical Analysis with Marketing Applications
43.931 Marketing Research
43.934 New Product Development
43.936 Strategy Problems of Mass Distributors
43.941 Industrial Marketing

Operations Management

45.809 Advanced Operations Management
45.833 Operations Management in the Health Care System
45.902 Planning and Control of Manufacturing Operations
45.965 Management of Small Business Enterprises
49.904 Contemporary Problems in Managing Complex Operating Systems
49.907 Operations Management Game

Small Business Management

45.829 New Ventures: A Career Choice
45.965 Management of Small Business Enterprises
45.968 Management of New Enterprises

RECOMMENDED PART-TIME PROGRAM FOR STUDENTS ENTERING AFTER JANUARY 1, 1977

Quarter	*Number*	*Course*
1	41.811	Financial and Managerial Accounting
	45.815	Behavioral Concepts
2	41.812	Control I
	45.816	Organizational Behavior I
3	49.901	Managerial Economic Analysis I
	49.902	Quantitative Analysis I
4	49.909	Managerial Economic Analysis II
	49.903	Quantitative Analysis II
5	43.811	Marketing Management I
	44.811	Financial Management I
6	43.812	Marketing Management II
	44.812	Financial Management II
7	45.805	Operations Management I
	49.932	Introduction to Computer Applications
8	45.806	Operations Management II
		Elective
9	45.817	Organizational Behavior II
		Elective
10	41.813	Control II
		Elective
11	45.834	Policy: Environmental Analysis
		Elective
12	45.836	Policy: The Formulation of Strategy
		Elective
13	45.837	Policy: The Implementation of Strategy
		Elective
14		Elective
		Elective

TRANSITION INSTRUCTIONS FOR CURRENT STUDENTS

M.B.A. candidates who began the program before January 1st, 1977 must fulfill the degree requirements established at the time of their enrollment. For most current students, this means the completion of 24 graduate business courses.

The recommended sequence of courses for part-time students enrolled before January 1, 1977 is listed below.

Recommended Part-Time Program for Current Students

There can be some flexibility in the method of progression of the part-time student, but there is listed below the suggested sequence which is designed to accommodate most part-time students. Based on a program of two courses per quarter and with the student taking courses three

quarters per year (summers excluded), all degree requirements will be completed in four years.

Quarter	*Number*	*Course*
1	41.811	Financial and Managerial Accounting
	45.815	Behavioral Concepts
2	41.812	Control I
	45.816	Organizational Behavior I
3	49.932	Introduction to Computer Applications
	49.902	Quantitative Analysis I
4	49.901	Managerial Economic Analysis
	49.903	Quantitative Analysis II
5	43.811	Marketing Management I
	44.811	Financial Management I
6	43.812	Marketing Management II
	44.812	Financial Management II
7	45.805	Operations Management I
		Elective
8	45.806	Operations Management II
		Elective
9	45.836	Policy: The Formulation of Strategy
	45.817	Organizational Behavior II
10	45.837	Policy: The Implementation of Strategy
	41.813	Control II
11		Elective
		Elective
12		Elective
		Elective

OTHER GRADUATE-LEVEL PROGRAMS IN BUSINESS

The Center for Management Development

Management Workshop

The Management Workshop is designed chiefly for middle managers who have demonstrated the potential for promotion into higher organizational levels. It provides a comprehensive outline of the major areas of business through graduate-level courses in organizational behavior, financial analysis and control, operations management, marketing, and economic forecasting.

Classes in four subjects are scheduled for each of twelve Fridays from 8:30 a.m. to 5:00 p.m. at Northeastern's Henderson House Conference Center in Weston, Massachusetts. There is a choice of two sessions per year. The fall session begins the third Friday in September and ends in mid-December; the spring session starts the first Friday in March and continues twelve consecutive Fridays through mid-May.

Management Development Program

The Management Development Program is a graduate-level course in business, designed for experienced managers who have had responsibility for a major task, function, department, division, or independent enterprise. Its general aim is to improve the manager's overall performance.

There is a choice of two six-week sessions spaced over five months, October through February or January through May. Participants attend two consecutive weeks of classes at the outset and thereafter one week in each of the remaining four months. This approach offers a tested alternative to organizations which recognize the need for manager training but find it difficult to release a key man for lengthy periods of study. A certificate is awarded to all who successfully complete the course work.

Graduate School of Professional Accounting

The Graduate School of Professional Accounting offers a 15-month program for non-accounting majors that leads to the degree of Master of Science in Professional Accounting. This unique program combines 12 months of class work with a three-month internship in a public accounting firm.

Information may be obtained by writing to:
Graduate School of Professional Accounting
206 Hayden Hall
Northeastern University
Boston, Massachusetts 02115

The Program for Advanced Study in Business Administration

The Program for Advanced Study in Business Administration has been instituted through the Graduate School of Business Administration. The main objective is to provide advanced work in business administration to meet the needs of a rapidly changing environment. Anyone who holds an M.B.A. or its equivalent is eligible. For further information contact the office of the Graduate School of Business Administration.

description of courses

21.840 Sociology of Medicine
Social aspects of illness and medicine, historically and cross-culturally, illness and the medical profession in modern society and their structural settings: the community, the hospital, the medical school. Research studies in the field will be examined critically and problems for future research will be specified.

30.9R3 Writing for the Professions
This course shall consider general writing problems and those posed by particular professional responsibilities. *Prep. 15 Q.H. of Grad. Credit.*

39.823 Government Finance
A survey of governmental expenditure, revenue, and debt systems, with emphasis upon their economic effects and their relationship to principles of economic welfare. Discussions of taxation, tax incidence, tax theory, debt management, and employment levels. *Prep. 15 Q.H. of Grad. Credit.*

39.825 Fiscal Policy
Development of a conceptual framework to assess the impact of government policies on attaining full employment, price stability, economic growth, and other economic goals of the public sector. Special emphasis is given to conflicts resulting from simultaneously trying to achieve all goals while combating the problems of inflation and stagnation. *Prep. 15 Q.H. of Grad. Credit.*

39.833 International Economics
Four areas, history, theory, policy and doctrine, are considered in relating the United States to the rest of the world, with emphasis on theory and policy. A study of money, gold- and/or paper-currency, in international trade and capital movements and the balance of payments are combined with evaluated proposals for international monetary system reforms and other trade agreements recommending more cooperation and integration. *Prep. 15 Q.H. of Grad. Credit.*

39.9H1 Economics of Medical Care and Health Manpower
The organization of medical care, the problems associated with various alternative delivery systems, the utilization and availability of physicians and other categories of paramedical personnel, the growth and pressures exerted by third party payers, and consideration of federal, state and muncipal participation in the delivery of quality medical care under various alternatives for national health insurance. *Prep. 15 Q.H. of Grad. Credit.*

39.9T5 Capital Markets
Primary courses of savings and demand for financial assets; role of financial intermediaries; banking system and government lending agencies. Demand for funds and real investment — mortgage, corporate and government securities markets; interdependence of rate structures. Flow of funds data in relation to national income accounts. *Prep. 15 Q.H. of Grad. Credit.*

41.811 Financial and Managerial Accounting
An introduction to accounting systems, including the development of financial statements. Includes a critical appraisal of analytical techniques of evaluating the firm's potential through historical data. *Prep. none.*

41.812 Control I
After examining the role which profit maximization plays as an entity objective, alternative courses of action for goal achievement are integrated into a programmed budgeting process. Emphasis is given to the budget as a planning, motivating, coordinating, evaluating, and re-planning device. *Prep. 41.811.*

41.813 Control II
A study of the integration and coordination of short-range programs with long-range plans and the control mechanisms which enhance appropriate conformance with the strategic budget. Primary emphasis is on organizations decentralized into divisional units. *Prep. 15 Q.H. of Grad. Credit.*

41.816 Management Control of Health Service Systems
The objective of this course is to develop a competence in conceptualizing and managing the planning and control requirements of organizations operating in the health services domain. Major topics include: planning, budgeting, responsibility accounting, cost analysis, and cost control. The role of the controller in these activities is also examined. The course embodies the idea of a system's integrating these requirements. *Prep. 15 Q.H. of Grad. Credit.*

41.817 Fiscal Planning, Budgeting and Control of Health Care Institutions
Deals with financial planning, budgeting and control by studying: fiscal organizations, short and long range financial planning, impact of government regulations, financial reporting, cash flow analysis and forecasting, third party reimbursement and capital financing, all within traditional and emerging health care institutions. *Prep. 45.975 or permission of faculty.*

41.821 Accounting Problems for Decision-Making
This course is designed to extend the accounting knowledge of the M.B.A. student beyond the work of the core sequence in the accounting area. The approach is a study of contemporary accounting problems with both managerial and financial implications. These include: (a) lease vs. buy, and proper reporting procedures; (b) the implications of inflation, foreign operations, and tax regulations; (c) human resources accounting, especially pension and other benefit plan costs; and (d) the impact of segmental reporting. *Prep. 41.811, 41.812.*

41.825 Management Performance Appraisal
A critical examination of traditional management appraisal, as well as recently proposed techniques. External appraisal of aggregate management performance and internal appraisal of individual management performance are covered. *Prep. 41.812.*

41.862 Tax Factors in Business Decisions
A survey of the Internal Revenue Code and its implications for choice of organizational form, corporate reorganizations, compensation policies, and foreign business operations. Mergers and acquisitions and the management of depreciable

property are examined in the light of decisions made by the Internal Revenue Service and the tax courts. The emphasis is on discussion and research into corporate income tax problems that affect business decisions. *Prep. 15 Q.H. of Grad. Credit.*

43.811 Marketing Management I
The objectives of Marketing Management I and II are twofold: 1. to provide the student with a comprehensive understanding of basic marketing functions, institutions, and concepts; and 2. to develop the student's ability to analyze and make recommendations about business problems that involve the creation, distribution, and sale of goods and services. Marketing Management I emphasizes the definition of marketing problems, demand analysis, consumer analysis, and market research. *Prep. none.*

43.812 Marketing Management II
A continuation of Marketing Management I, with emphasis on the formulation and implementation of marketing strategy. Emphasis is placed on product policy, channels of distribution, pricing, advertising, personal selling, and the development of integrated marketing programs of action. *Prep. 43.811.*

43.910 International Marketing
Objective is to develop an understanding of: 1. the opportunities and challenges facing the international marketing executive; 2. the decision-making process in marketing goods abroad; and 3. the environmental forces—economic, cultural and political—affecting the marketing process and acting as constraints on the development of marketing strategies abroad. Lectures, discussions, reports, and cases. *Prep. 43.811.*

43.925 Sales Management
Designed to help the student develop both the understanding and decision-making skills necessary to build and maintain an effective sales organization. Cases and readings are used which examine the strategic and operating problems of the sales manager. Four major topic areas are: 1. the selling function, 2. sales management at the field level, 3. the sales executive, and 4. sales and marketing management. *Prep. 43.812, or permission of the instructor.*

43.930 Statistical Analysis with Marketing Applications
The purpose of this course is to introduce students to some of the multivariate statistical techniques that have been used in the analysis of consumer survey data. Both theory and applications will be discussed. While most applications will be in the marketing area, illustrations will also be given in order to show how the methods presented can be used in other areas such as jury selection, politics and public policy decisions. Topics to be covered will include (1) Design and Analysis of Experiments, (2) Regression Analysis, (3) Discriminant Analysis and (4) Non-Parametric Statistics. *Prep. 49.902, 43.811 or consent of instructor.*

43.931 Marketing Research
Major methods and techniques of marketing research are examined to understand the function of research in marketing decision making. Specific topics include research design, determination of information requirements, data collection methods, experimentation, sampling, data analysis, and use of the canned program. *Prep. 43.811 and 49.902.*

43.934 New Product Development
The importance of new products to the survival and prosperity of firms continues to grow with increasing shortening of product life cycles; with changes in technology, competition, and consumer tastes; and with increasing operating costs. For most firms, coping with the problems of environmental change through modification of the product line is both vital and difficult. This seminar will have as a primary concern the examination and analysis of some of the problems firms face in directing and managing their new product development activities. *Prep. 43.812.*

43.936 Retail Management
Examines selected major strategy problems facing large-scale food and general merchandise distributors; selects store locations; determines merchandising and promotional policies; and formulates long-range plans. Cases and issues are explored from the viewpoint of the management of prominent supermarket, department store, and discount retailers, with some attention to wholesalers. Designed primarily for students interested in retailing or wholesaling, and those concerned about mass distribution in marketing consumer goods. *Prep. 43.812.*

43.941 Industrial Marketing
The problems of industrial concerns in marketing their products and services to industrial, business, and organizational customers. Emphasis is placed on determining these customers' needs and on developing programs to satisfy these needs. Topics include the roles and responsibilities of the marketing executive engaged in industrial distribution, advertising, and research, as well as roles and responsibilities of industrial salesmen, sales supervisors, and selling agents. *Prep. 43.812.*

44.811 Financial Management I
This course and its required sequel, 44.812, acquaint students with concepts, practices, and procedures of financial management and offer training in analytical approaches which help them make wise decisions affecting the flow of funds within an organization. Instruction is primarily through readings and cases. *Prep. 41.813.*

44.812 Financial Management II
Concentrates on long-term sources and uses of funds, with an introduction to capital budgeting techniques and the concept of cost of capital. Risk and return trade-offs are included. Broad topics of overall financial strategy and timing are examined. Frequently, evening students are required to prepare a term report based upon data gathered on their jobs and/or from financial literature. *Prep. 44.811.*

44.814 International Financial Management
Comprehensive coverage of the field of international financial management, including the fundamental problems of financial forecasting, multinational capital budgeting, affiliate financial structures, international fund movements and instruments of international finance, import-export financing, and the characteristics of foreign environments. Background information is sought in the interpretation of U.S. foreign investment controls and the reaction of foreign governments to U.S. interference. *Prep. 44.812.*

44.816 The Management of Financial Resources
Conceptually, decisions regarding the sources and uses of long term funds should

be made simultaneously. This course examines both aspects of the decision. A thorough analysis of capital budgeting techniques are combined with an assessment of factors affecting a firm's capital structure. Company assets and how they should be financed are the central questions. *Prep. 44.812.*

44.818 Working Capital Management
The current assets and liabilities sections of an organization's balance sheet determine the amount of long term capital committed to working capital uses. This course examines strategies and analytical approaches for making wise decisions affecting these amounts. Material on money market conditions is included. *Prep. 44.812.*

44.901 Finance III—Advanced Financial Management
An opportunity to study several important areas of financial management in greater depth than is possible in the basic finance courses. Some of the topics are: corporate capital structure, dividend policy, capital budgeting, and the management of current assets. Instruction is primarily through assigned readings and classroom case discussions. *Prep. 44.812.*

44.921 Investment Analysis
Investment principles and risks. The objective is the development of a sound investment program, with attention to identification of investment objectives and risks. Emphasis is placed on the techniques of analysis and evaluation of various types of securities and the associated risks, the operation of the securities markets, and the various methods of portfolio management. *Prep. 15 Q.H. of Grad. Credit.*

44.924 Mergers and Acquisitions
This seminar explores the economic environment which has recently given rise to a large number of corporate mergers and the business factors underlying these corporate combinations. The financial, managerial, accounting, and legal factors affecting mergers are studied. Students learn how to appraise a potential merger and structure a merger on advantageous terms. Instruction is through directed readings, case discussions, and independent research. *Prep. 44.812.*

44.935 Management of Financial Institutions
The intent is to acquaint students with the broad range of decision-making problems faced by major financial institutions such as commercial banks, savings and investment institutions, and finance companies when viewed as competitive, profit-seeking business entities. Major areas of concern in the course are: sources and uses of funds by financial institutions, competition, regulation, and strategic policy planning by financial institutions. Instruction is primarily through readings and cases. *Prep. 44.812.*

45.805 - 45.806 Operations Management I & II
The primary objective is to develop understanding of management in the operations system — its design operation, control, evaluation, and modification. Two second objectives: (1) to increase capability for managerial decision making in technical matters; and (2) to develop an appreciation of the operations manager's job. Topics include: design of product, design of process, human factors engineering, development of capacity, line balancing, man-machines systems, work measurement, job evaluation, wage payments system, project network models, production planning, inventory management, production scheduling and control, and management of

product quality and statistical quality control. Operations Management I concentrates on the design of the operations system; whereas Operations Management II focuses on the operation and control. Prep. Basic courses in accounting and control, finance, quantitative analysis, and organizational behavior or permission of the instructor. *Prep. 45.805 for 45.806.*

45.809 Advanced Operations Management
This course is designed for those whose career goals are positions of responsibility in the management of the manufacturing or operations function of an enterprise. Although the primary focus is upon manufacturing enterprises, complex operating problems in service-oriented institutions are included. Drawing primarily upon case studies, the course focuses on the development and implementation of detailed responses to the management requirements of operating systems. Emphasis is given to emerging technological developments, such as computer-based mechanization and automation, and to new developments in several areas of production and operations management. *Prep. 45.806.*

45.810 Operations Management in the Service Sector
Since the concepts and techniques of Operations Management were first developed in manufacturing settings, traditional courses in operations management have dealt with manufacturing. These concepts and techniques have wide applicability in service and non-profit sectors which need the tools and techniques already used in manufacturing. Concentration is on application of concepts and techniques in the service sector. Industries include: restaurant, health-care, recreation, brokerage, insurance, and airline. *Prep. 45.805 or permission of the instructor.*

45.815 Behavioral Concepts
A brief examination of major concepts and findings of the behavioral sciences which have particular pertinence to business and administration. Systematic ways of understanding behavior are developed, taking account of technical, economic, political, and human factors. Individual development is studied from the standpoint of character, perception, learning, and motivation. Behavior of people in small groups is also examined in terms of the structure and dynamics of the individuals in the group. *Prep. none.*

45.816 Organizational Behavior I
Basic findings and concepts of the behavioral sciences are related to the specific aspects of behavior in formally constituted organizations. Supervisory behavior is examined in the behavioral context, as well as relations between groups, in order to develop ways of achieving collaboration. *Prep. 45.815.*

45.817 Organizational Behavior II
The study of behavior in organizations is expanded to larger organizations in order to understand and deal systematically with the complex relationships found at this level. This course also provides an opportunity to apply knowledge about people in organizations to the improvement of organizational systems and to the process of achieving changes in organizations. *Prep. 45.816.*

45.819 Interpersonal Behavior
An intensive inquiry into communications from one person to another, the longest distance of all. Makes use of unconventional media for learning (selected films,

drama, and the short story) in which universal qualities of the interactions between people are described, analyzed, and reinterpreted to different settings in today's world. *Prep. none.*

45.820 Psychological Dynamics of Leadership
Reviews the existing approaches and hypotheses about the nature of leadership. Focuses on psychoanalytic theory as a foundation from which to understand leadership behavior. An extensive case history provides material for class discussion and illustration of the theories of leadership. *Prep. 15 Q.H. of Grad. Credit.*

45.821 Policy Formulation in Nonbusiness Institutions
This seminar focuses primarily on the decision-making process in government institutions, primarily at the Federal level. Readings portray nonrational perspectives on behavior, such as the cybernetic and political models of decisions. Their larger aim is to develop awareness of cognitive limitations of public policy decision-makers and the inherent dysfunctions of bureaucracies in which they operate. Class sessions explore the evolution of public policy, the role of analysis in policy formulation and implementation, and the methodology of policy analysis. The seminar is concerned with strategic decisions rather than with day-to-day operating problems. *Prep. 15 Q.H. of Grad. Credit.*

45.823 Career Planning and Development
Effective career planning and development is best viewed through the larger context of an individual's actualization process in life. Career evaluation considers personal values, interests, aspirations, sense of self-worth and managerial skills; and on the other hand, the realities of specific occupational and professional choices. Each participant will generate and analyze a wide variety of data to provide better insight into his goals, interests, and managerial skills. Greater career fulfillment is the objective. *Prep. 45.816.*

45.824 Organization Behavior in Non-Profit Environment
Human services organizations involved in health care, welfare, and education are studied in reference to recent behavioral theories and concepts dealing with the internal and external complexities and inter-relationships of large-scale organizations. Term projects are designed to conduct and analyze a problem situation and develop plans for implementing change. Readings, cases and seminars. *Prep. 45.815, 45.816.*

45.828 Seminar in Growth Strategies for Corporate Management
An opportunity for in-depth research and analysis of growth strategies available to business firms. In a seminar setting, students examine firm and industry approaches to growth through expansion and diversification. Special emphasis is placed on the use of research and acquisition as means for achieving growth objectives. *Prep. 45.825, and permission of the instructor.*

45.829 New Ventures: A Career Choice
This course enables students to examine the nature of entrepreneurship and the appropriateness of self-employment for an individual. The focus is on the decision to own and operate one's own business. Students examine the nature of the values, motivations, goals, and life style required by the entrepreneurial role. Guest speakers, cases, selected readings, and self-assessment exercises help students

identify the congruency between their own interests and goals and an entrepreneurial career. The course also offers potential value for prospective loan officers, investment bankers and venture capitalists, CPAs, management consultants and others whose career activities may involve them with entrepreneurs and managers of new ventures or smaller companies. *Prep. 15 Q.H. of Grad. Credit, or permission of instructor.*

45.833 Operations Management in the Health Care System
This course serves those whose career goals are positions of responsibility in the management of the health care system. The objectives of the course are: (1) to provide a basic understanding of operations management problems existing in the health care system, and (2) to develop decision-making ability to deal effectively with these problems. Topics covered in the course are: the fundamentals of management in the health care system, organizational planning, operations planning and control, utilization of resources and policy considerations in effective and efficient operation of the health care system. *Prep. 45.805 and 45.806, or permission of instructor.*

45.834 Policy: Environmental Analysis
This first of three policy courses will focus on the environment in which strategy must be formulated in both profit and non-profit organizations. Techniques of environmental analysis are included with particular emphasis on the political-legal, economic, social, and technological environments as they relate to and influence the formulation of strategy. *Prep. all other required courses with the exception of 41.813, 45.817, 45.836 and 45.837.*

45.835 Seminar in Organizational Development
Organizational development is the process of deliberate organizational change that is planned, organization-wide, and managed from the top so as to increase organizational effectiveness through planned intervention by change agents. This course examines organizational development as an emerging professional discipline, focusing on identifying variables affected by a change program and developing an understanding of methods and techniques. *Prep. 45.817.*

45.836 Policy: The Formulation of Strategy
A continuation of 45.834. Approaches to strategy formulation are developed, compared, and contrasted. Particular emphasis is on the process by which strategy gets formulated in actual business settings, including the influence of personal values on strategy formulation, who actually makes strategic decisions, what environmental and internal information is required to make strategic decisions, and what criteria are used to make the decisions. The role of different management levels in the process is considered. *Prep. 45.834.*

45.837 Policy: The Implementation of Strategy
A continuation of 45.836 with emphasis on the implementation of strategy. Approaches to strategy implementation in both profit and non-profit organizations are compared and contrasted. Topics include: organizational structure and behavior, long-range planning, control and motivation systems, information systems, and leadership. All topics are considered within the systems framework of organizational strategy. *Prep. 45.836.*

45.838 Policy Formation In Health Care
A focus on the problem of defining and implementing policy in the health care sector. The various internal and external components of the health care system are analyzed as they relate to policy-making and implementation. The course also includes a discussion of nontraditional methods of health care delivery such as neighborhood health care centers, health maintenance organizations. *Prep. 15 Q.H. of Grad. Credit.*

45.840 Managerial Styles and Sex Stereotypes
Managerial roles are influenced by the leadership styles played by managers of one's own sex as well as those of the opposite sex. The attitudes of management regarding values, interests, aptitudes, and abilities of a person can profoundly influence the personnel decision-making process. Effective managerial leadership encompasses a wide range of decision-making behaviors. These processes are profoundly influenced by socialization, cultural beliefs and identity formation associated with early learning. The dynamics of this self-awareness in understanding sex-role stereotyping, myths, and biases associated with executive responsibility will be examined. Lectures, case discussions, films and guest speakers. *Prep. 15 Q.H. of Grad. Credit.*

45.841 Public/Private Service Marketing Systems
Examines public/private institutional systems involved in providing public goods and services (e.g., health care, housing, education, pollution control) from the perspectives of various present or potential participants (business, government, non-profit institutions). Emphasis on analyzing the systems and processes involved, the roles of various participants, and the alternative strategies appropriate for particular participants. *Prep. 15 Q.H. of Grad. Credit.*

45.843 Environmental Pressures and the Multi-National Corporation
Rapid multidimensional change in the World Environment creates substantial pressures on corporations, especially large multinationals. The purposes of this course are to identify and evaluate: (1) environmental pressures of most likely significance in the coming decade(s); (2) analysis and planning approaches for the manager's interpretation of the changing world environment; and (3) possible corporate responses to environmental pressures. Consideration will also be given to ideological issues; pragmatic, strategic and tactical adaptation; and structure and managerial changes appropriate to likely developments. *Prep. 15 Q.H. of Grad. Credit.*

45.902 Planning and Control of Manufacturing Operations
A study of the problems of managing the flow of materials, operations, and information within an organization in response to, or anticipation of, market demands. The concepts and techniques discussed are applicable in a variety of institutional settings. Topics include: inventory management, demand forecasting, manpower and operations scheduling, project management, and integrated operations control systems. The tone of the course is pragmatic; particular emphasis is on practical evaluation and problems of implementing the analytic methods discussed. *Prep. 45.806 or permission of the instructor.*

45.951 Executive Development
An examination of the executive position in an organization and the personal characteristics and skills which it requires. The course examines the effects of

cultural change and shifting mores on motivation and management control, with their implication for developing appropriate organizational relationships. Report writing, oral reports, and leading of group discussions are dominant techniques. Student evaluation is encouraged. *Prep. 15 Q.H. of Grad. Credit.*

45.965 Management of Small Business Enterprises
Problems in various beginning stages of management of new small enterprises. Case studies develop analytical approaches for appraising the risks and rewards of potential growth opportunities, as well as operating problems. Problems range from locating, evaluating and financing a small company, to the survival and growth of an established business. Guest speakers relate pertinent business experiences to in-class activities. *Prep. 15 Q.H. of Grad. Credit.*

45.968 Management of New Enterprises
Oriented toward the entrepreneur. Consideration given to locating and evaluating business opportunities introduced by new ideas, product development, licensing, inventions, patents, etc. The organization, start, and growth of a new business or the acquisition of a going concern, including fund raising and related state regulations. *Prep. 15 Q.H. of Grad. Credit.*

45.969 Government and Business
Analysis of the role of government as a regulating force, as well as the nature and impact of government fiscal, economic, and socio-economic policies on the conduct of business. The political and economic philosophies behind greater government participation in the economic structure of the nation as indicated by public-utility, anti-trust, labor, and socioeconomic legislation. *Prep. 15 Q.H. of Grad. Credit.*

45.971 Personnel Management
The purpose of this course is to provide knowledge of basic personnel functions: recruitment, selection, placement, rewards, compensation, training and development of employees. Implications of new government regulatory systems also considered such as equal opportunity, safety and pensions; to demonstrate implementation of behavioral theories at the workplace. Emphasis on partnership of specialists and generalists in overall management of organizations' human resources. Lectures, cases and readings. *Prep. 15 Q.H. of Grad. Credit.*

45.972 Labor Relations
Review of U.S. labor history and traditional labor policy as well as implications of new regulatory systems on labor management relations such as equal opportunity and safety. Overview of collective bargaining processes applied to emerging sectors of union organization such as health care and education. Lectures, cases and readings. *Prep. 15 Q.H. of Grad. Credit.*

45.973 New Sectors of Collective Bargaining
A focus on new sectors of bargaining: 1. by public employees, including municipal, state, and Federal; 2. by professional associations, including those of teachers, doctors, nurses, and engineers; and in the mainly unorganized sectors; i.e., agriculture, health care industry, and so-called white-collar-service areas. The purpose is to study the variety of patterns emerging in these sectors as a result of the interplay of the following forces: 1. presence or absence of a national labor law or policy; 2. relationship to existing trade union structure and industrial relations system; 3. oc-

cupational characteristics and industry or service technology, and 4. productivity and growth. Varying issues in collective bargaining are discussed through cases, readings, and a group term project, and by invited practitioners. *Prep. 15 Q.H. of Grad. Credit.*

45.975 Introduction to Health Care Systems
The present state of the system, dealing with its history and process and describing the parts of the delivery system, the payers, the consumers, the manpower, and the policy implications. Comparative health care systems will be discussed. Lectures, discussions and readings. Recommended for those entering the field. *Prep. 15 Q.H. of Grad. Credit.*

45.976 Workers in the Health Care System
The present health care system in the United States is in the process of major change generated by both the internal and external social, legal, and professional environments. The purpose of this course is to describe and analyze some of the dynamics and complexities of these changes and to consider how these changes affect the workers in the system. In turn, the worker's influence on these changes is studied. The foci are the past, present, and future of major occupation levels and groupings servicing the system, their relationship to each other and to the total system. A major feature of the course is a group research project. Case studies, readings, lectures, and guest speakers are also used. *Prep. 45.815, 45.816.*

45.977 Information Systems for Health Care Facilities
Introduction to the complexities of the quantity and variety of information availability in the field and the state of the technology capability, as well as an understanding of the system's components through use of this information. Course covers systems information flow and new computer techniques. Cases, readings, and on-site visits. *Prep. 15 Q.H. of Grad. Credit.*

45.985 Management of Research and Development
Some corporations grow more rapidly than their competitors because of better management of their technical programs. This course focuses on the unique problems of R & D management through readings and case studies of the important considerations involved in dealing with scientists and engineers as individuals; planning, organizing, and controlling research; and establishing a climate for research. *Prep. 41.811 and 45.817*

45.991 Business Law—Law of Contracts, Agency, and Sales
Designed to give the student a basic knowledge of the legal aspects of contracts and the results of contractual obligations. Attention is paid to the employment contract in general, with emphasis on the principal and agent, and the master and servant relationships. The law governing the sale of personal property as reflected in the Uniform Commercial Code is incorporated. *Prep. 15 Q.H. of Grad. Credit.*

45.992 The Law of Business Organizations and Negotiable Instruments
The Law of Negotiable Instruments as reflected in the Uniform Commercial Code, with special consideration given to commercial paper used in business transactions. The law governing formation and operation of partnerships, corporations, and other business organizations, with emphasis on the legal results and operations of those

concerned with the liability of members thereof. A study of the legal framework within which the formal business organization must operate. *Prep. 45.991 and 15 Q.H. of Grad. Credit.*

45.993 Labor Law
An overview of constitutional and legal problems involved in labor organizing, industrial relations, labor negotiations, labor contract enforcement, and dispute resolution in both private and public sectors of labor administration. Cases are studied for the legal principles underlying common law, state and federal laws, and constitutional questions of power and authority. *Prep. 15 Q.H. Grad. Credit.*

45.997 Special Studies in Business Administration (1 to 3 Q.H. Credit)
A special tutorial arrangement between a student and a faculty member for a guided reading, research, laboratory, fieldwork, report, or teaching experience. It is for graduate students who desire to do advanced work or carry out some special investigation of a problem in business administration not specifically covered elsewhere in the curriculum. Students must petition the Committee on Graduate Study in Business Administration for permission to register in this course. This petition should include an outline, a brief description of the work planned, and an indication of the professor to whom the student will be responsible. The professor will submit to the Graduate Office a letter outlining in some detail the nature of the work that the student will be doing in the course. The petition will be submitted after the student has received permission to take the course from a member of the College of Business Administration faculty. The course carries variable credit, ranging from one to three quarter hours. *Prep. 15 Q.H. of Grad. Credit.*

45.998 Special Studies in Business Administration (3 Q.H. Credit)
See 45.997 for course description.

45.999 Special Studies in Business Administration (3 Q.H. Credit)
See 45.997 for course description.

48.801 Seminar in Transportation
The objectives are twofold: 1. to provide a basic understanding of the functions and importance of the domestic transportation system, and 2. to develop the student's ability to analyze government policies related to transportation. The cost, service, and pricing characteristics of the several modes of transportation are examined. Emphasis is given to the special problems which confront both carriers engaged in the various forms of transportation and shippers who rely upon their services. *Prep. 15 Q.H. of Grad. Credit.*

48.901 Transportation and Corporate Distribution
Study of the design and management of physical distribution systems to facilitate the flow of goods through distribution channels. It covers aspects of plant and warehouse locations, inventory controls, and selection of transportation carrier. The course includes the use of case problems in logistics. *Prep. 15 Q.H. of Grad. Credit.*

49.901 Managerial-Economic Analysis
Managerial economic analysis establishes the economic foundations and framework for managerial decisions. The course provides an introduction to the principles of economic analysis, economic institutions, and issues of public policy. It stresses the

interdependency of the economic decisions of the firm with industry structures and national economic policies. Topics covered include: sources, market decisions and market structure, employment and growth, and the economic role of governmental resource allocations. *Prep. none.*

49.902 Quantitative Analysis I

Decision making takes place in a probabilistic environment. The concept of statistical inference is emphasized, with the objective of generating and understanding the process by which the analyst draws conclusions from a small sample compared to the characteristics of a large data set. The techniques employed in decision making under uncertainty (payoff tables, decision trees) are also discussed. *Prep. None.*

49.903 Quantitative Analysis II

Introduction to the theory and practice of management science and operations research. The topics of regression analysis, linear programming, and simulation are discussed in text and case material; emphasis is on practical application of these techniques. Issues of problem definition, model building, relevant cost determination, solution generation, and implementation of results are considered. *Prep. 49.902.*

49.907 Operations Management Game

The Operations Management Game is a computer game of considerable complexity focusing on operations problems. Teams are formed to make several decisions affecting the operation of the firm for the next day: i.e., on hiring-firing, overtime, machine sequencing, maintenance, and capital expenditures. These decisions are then submitted to the computer and their consequences are provided as output to each team. The team reacts by preparing another set of entries to guide the firm's operation for the next day. During the game, models covered in operations research and the operations management courses are explored to determine their usefulness as decision aids. *Prep. 49.903, 45.806.*

49.908 Mathematics for Managerial Decisions

The two-fold objective of this course is: (1) to provide an introduction to the most important mathematical concepts and tools used today by modern management: and (2) to illustrate the applicability of mathematics to problems in economics, finance, production, marketing, statistics, computers and other related fields. This course is designed for students who do not consider themselves mathematically sophisticated or for those needing a review before taking other quantitative courses. Topics to be covered are: Set Theory, Functions and Systems of Equations, Matrices, Differential Calculus, and Introduction to Mathematical Optimization Models. *Prep. None.*

49.909 Managerial Economics II

The objectives of this course are to develop proficiency in the application and the use of economic concepts for decision-making in business and to relate the economic environment to the business decisions. Topics like estimation of demand and cost industry structure and its impact on the conduct of business firms, antitrust legislation and economic forecasting are discussed. *Prep. 49.901 (or equivalent), 49.902 or permission of instructor.*

49.918 Information Theory and Systems

The objective of this course is to develop a framework for the analysis of communication and information systems in organizations. Aspects of communications theory are

studied as background for building this framework and its underlying theory is tested. Topics include development of an analytical framework for viewing information systems and communication in organizations. Various aspects of communications theory are discussed and analyzed. A major objective of the communications and informations flow in organizations is to tie these events back to the underlying theory. *Prep. 15 Q.H. of Grad. Credit.*

49.932 Introduction to Computer Applications
A business-oriented introduction to data processing functions and systems. Introduction to the history, terminology, technology, and economics of data processing hardware and software. Management issues in the design, selection, evaluation and use of computers and computer services. Individual familiarization with elementary computer programming by using either batch or time-shared computer facilities to solve simple business-oriented exercises. When feasible, a visit to a data processing center is conducted. *Prep. None.*

49.933 The Computer and Its Applications II
The Management Information System (MIS) concept which stresses how a computer-powered information system can benefit all levels of management is emphasized. The course illustrates the economics of MIS and computers, describing the steps necessary for successful installation and employment of MIS concepts. An extensive case study illustrates systems design, dollar/benefit tradeoffs, and the proper level of management involvement. Familiarization with the systematic or systems approach to analyzing and solving computer and information systems problems as well as general business problems. Business management rather than computer technology is stressed. *Prep. 49.932.*

49.935 Computer Applications in Management Science
Discussion of the technical, economic, and procedural aspects of applying quantitative techniques of management science to planning and operations problems. Heavy emphasis is on the computer's role in this process. Concentration is on selected techniques such as linear programming, simulation, and multiple regression analysis. Practical problems of designing computer programs, selecting canned packages, gathering data, and implementing results are considered. The required term project allows an in-depth study of an area and/or technique of the student's choosing. This project may take a variety of forms: a computer model written by the student, use of a canned package or a model written by others, library research report, formulation of a practical problem for future solution. Ability to program is not required, nor is computer programming emphasized; however, extensive time-sharing and batch-processing computer service is available for those who wish to use it. *Prep. 49.902, 49.903, and 49.932.*

undergraduate universities attended by students

Air Force Academy
Amherst College
Arizona, University of
Assumption College
Bates College
Bentley College
Boston College
Boston University
Bowdoin College
Brandeis University
Bridgeport, University of
Brooklyn Polytechnic Institute
Brown University
Bucknell University
Calcutta, University of (India)
California, University of
Canisius College
Case Institute of Technology
Catholic University of America
Catholic University (Venezuela)
Cincinnati, University of
City College of New York
Colby College
Colgate University
Columbia University
Connecticut, University of
Cornell University
Dartmouth College
Delaware, University of
Denison University
Drake University
Drexel University
Duke University
Fairfield University
Florida, University of
Fordham University
Franklin and Marshall College
Gettysburg College
Hartford University
Harvard University
Hawaii, University of
Hiram College
Hobart College
Hofstra University
Holy Cross College
Houston, University of
Illinois, University of
Institute of Science (India)
Ithaca College
Johns Hopkins University
Lafayette College
Lake Forest College
Lehigh University
Lowell Technical Institute
Loyola University (Chicago)
Maine, University of
Maryland, University of
Massachusetts Institute of Technology
Massachusetts Maritime Academy
Massachusetts, University of
McGill University (Canada)
McMaster University (Canada)
Merrimack College
Nebraska, University of
New Hampshire, University of
Northeastern University
Notre Dame, University of
Ohio Wesleyan University
Pennsylvania State University
Pennsylvania, University of
Plymouth State College
Providence College
Radcliffe College
Rensselaer Polytechnic Institute
Rhode Island, University of
Rochester Institute of Technology
Rochester, University of
Rutgers, The State University (New Jersey)
St. Anselm's College
St. John University
St. Lawrence University
Simmons College
Smith College
Stanford University
State College at Boston
State University of New York, at Buffalo
State University of New York, at Genesco
State University of New York, at Oneonta
Stonehill College
Suffolk University
Sydenham College (India)
Syracuse University
Tennessee, University of
Texas, University of
Tufts University
United States Merchant Marine Academy
United States Military Academy
United States Naval Academy
Vermont, University of
Villanova University
Virginia Polytechnic Institute
Wesleyan University
Worcester Polytechnic Institute
Yale University

faculty directory

Name	*Room*	*Extension*
Agostino, Donald J.	305 HA	437-3257
Ammer, Dean S.	213 HA	3252
Anderson, Harley H.	225 HA	3270
Arnett, Mathew D.	305 HA	3257
Castellano, John J.	213 HA	3253
Cerullo, Saverio	209 HA	3248
Chugh, Lal C.	209 HA	3248
Callazzo, Charles J.	322 HA	3260
Crotty, Philip T.	202 HA	3230
Curran, Joseph R.	213 HA	3252
DeVey, Robert	205 HA	3240
Dufton, Charles, H.	322 HA	3260
Dunn, Dan T.	322 HA	3260
Fetters, Michael L.	205 HA	3240
Fiumara, Angelo, J.	204 HA	3236
Frantzis, Stavros, S.	213 HA	3252
Godin, Victor	213 HA	3252
Golemme, Joseph, M.	206 HA	3244
Graetz, Herbert G.	305 HA	3257
Gross, Paul T.	209 HA	3248
Grusetskie, Maryann	224 HA	2714
Gubellini, Carlo E.	206 HA	3244
Hehre, Robert J.	209 HA	3248
Higgins, Richard B.	304 HA	3257
Hobart, Christine	305 HA	3257
Hudson, John B.	213 HA	3252
Janell, Paul A.	205 HA	3240
Jordan, John W.	202 HA	3230
Keith, Lyman A.	204 HA	3236
King, John	213 HA	3252
Kinnunen, Raymond M.	204 HA	3236
Kriebel, Henry A.	205 HA	3240
Lawler, Susan V.	224 HA	2714
Leary, John J.	212 HA	3274
Lieb, Robert C.	204 HA	3236
Lindhe, Richard	114 HA	3235
Malchman, Lawrence H.	114 HA	3235
Marple, Wesley W.	209 HA	3248
Massoud, Morcos	205 HA	3240
McCarthy, D.	302 HA	3255
McDonald, Philip R.	322 HA	3260
Minichiello, Rbt. J.	302 HA	3255
Moore, Thomas E.	224 HA	2714
Nielsen, Richard P.	322 HA	3260
Olive, Russell W.	302 HA	3255
Parsons, Robert A.	303 HA	3255
Priem, Andre P.	305 HA	3257
Reitz, Barbara W.	202 HA	3230
Rugina, Anghel N.	209 HA	3248
Santos, Richard J.	212 HA	3272
Scioletti, Daniel C.	204 HA	3236
Shelley, Charles	204 HA	3236
Slavin, Albert	205 HA	3240
Spencer, Myron, J.	212 HA	3274
Stephenson, Frederick J.	204 HA	3236
Sternal, Branch K.	322 HA	3260
Timmons, Jeffry A.	304 HA	3255

Ward, Raymond	209 HA	3248
Willett, Edward R.	209 HA	3248
Wheeler, Bric	212 HA	3273
Williams, Dennis S.	225 HA	3270
Wiseman, Frederick	322 HA	3260

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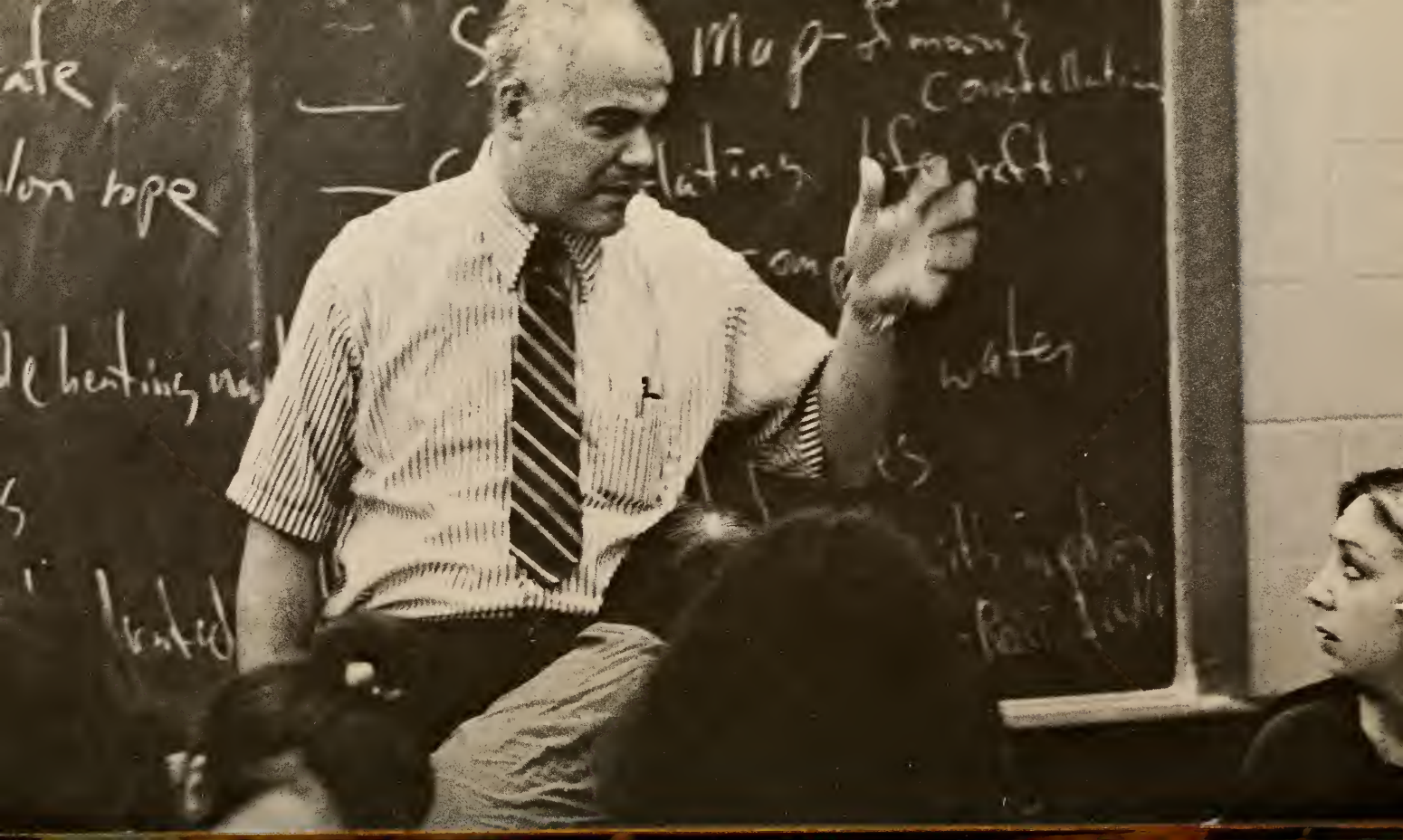
Map
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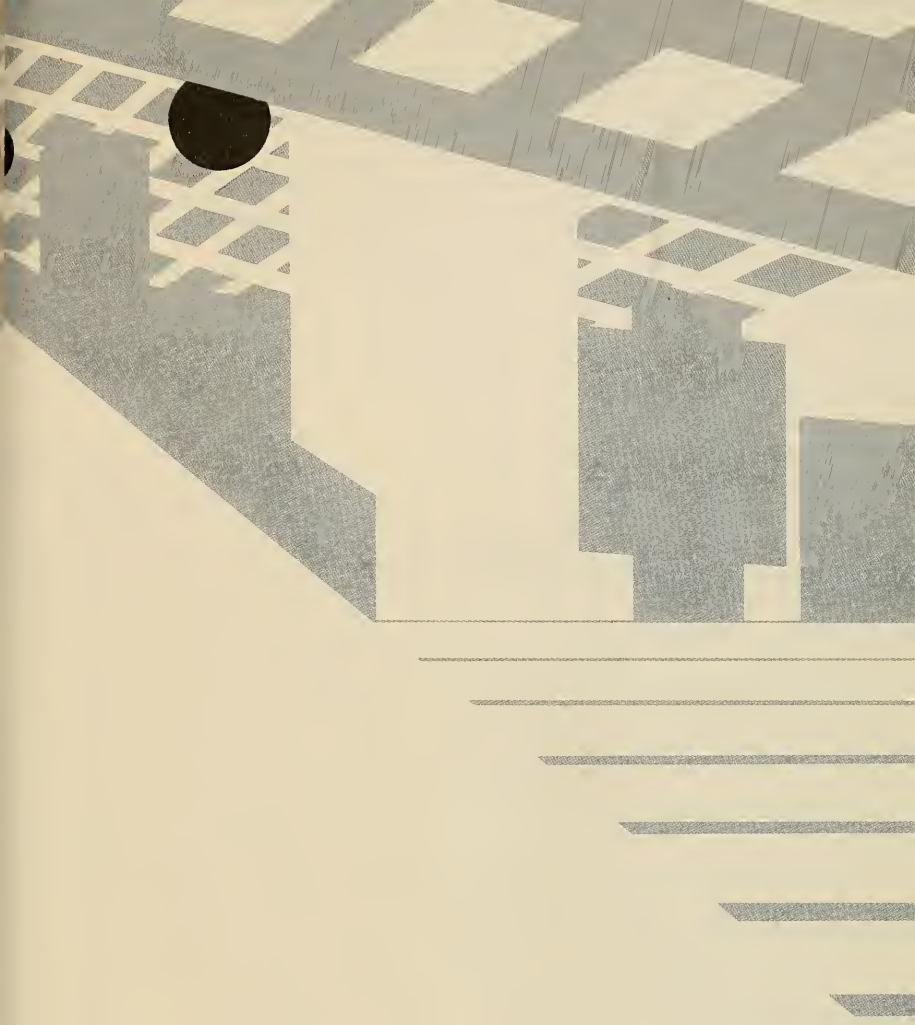

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NORTHEASTE UNIVERSIT

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MAP REFERENCE	Building	Building Designation
F6	Barletta Natatorium	BN
F10	Botolph Building	BT
E6	Cabot Physical Education Ctr.	CB
G7	Churchill Hall	CH
A6	Cushing Hall	CU
H6	Dana Research Center	DA
F5	Dockser Hall	DK
E9	Dodge Library	DG
G8	Ell Student Center and Alumni Auditorium	EC
F8	Forsyth Building	EL
G6	Forsyth Building Annex	FR
G5	Greenleaf Building	FA
F4	Hayden Hall	GR
F7	Hurtig Hall	HA
G10	Cahners Hall	HT
B6	Knowles Center (Volpe)	CA
E4	Knowles Center (Gryzmish)	KV
E4	11 Leon Street	KG
J3	African-American Institute	UO
H3	Mugar Life Sciences Building	AF
F9	Parker Building	MU
F3	Richards Hall	PA
E7	Robinson Hall	RI
H9	United Realty Building	RB
G5		UR

ACADEMIC CALENDAR 1975–1976

Fall Quarter 1975

Registration period (1:00–3:00 and 5:30–8:00 p.m.)

Boston	Monday-Thursday	Sept. 22–Sept. 25
Classes begin	Monday	September 29
Last day to drop a course	Wednesday	November 26
Examination period	Monday-Friday	Dec. 15–Dec. 19

Winter Quarter 1975–1976

Registration period (1:00–3:00 and 5:30–8:00 p.m.)

Boston	Monday-Thursday	Dec. 8–Dec. 11
Classes begin	Monday	January 5
Last day to drop a course	Friday	March 5
Examination period	Monday-Friday	Mar. 22–Mar. 26

Spring Quarter 1976

Registration period (1:00–3:00 and 5:30–8:00 p.m.)

Boston	Monday-Thursday	Mar. 15–Mar. 18
Classes begin	Monday	April 5
Last day to drop a course	Friday	June 4
Examination period	Monday-Friday	June 14

Summer Quarter 1976

Registration period (5:30–8:00 p.m.)

Boston	Wednesday & Thursday	June 16 & 17
Classes begin	Monday	June 28

UNIVERSITY HOLIDAYS 1975–1976

Columbus Day	Monday	October 13
Veterans' Day	Monday	October 27
Thanksgiving Recess	Thursday-Saturday	Nov. 27–Nov. 29
Christmas Vacation	Monday-Friday	Dec. 22–Jan. 2
Martin Luther King's Birthday	Thursday	January 15
Washington's Birthday	Monday	February 23
Patriots Day	Monday	April 19
Memorial Day	Monday	May 31
Independence Day	Monday	July 5
Labor Day	Monday	September 6

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admission, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or physical or mental handicap. In addition, Northeastern takes affirmative action in the recruitment of students and employees.

the governing boards and officers of the university

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Vernon R. Alden
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O. Kelley Anderson
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*Roy H. Beaton
*F. Gregg Bemis
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S. Whitney Bradley
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H. James Crossan, Jr.

Marshall B. Dalton
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*Edward Dana
William O. DiPietro
Alfred di Scipio
Estelle Dockser (Mrs.)
*William R. Driver, Jr.

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*William P. Ellison
Joseph A. Erickson
Robert Erickson

* Member of the Board of Trustees
† Deceased January 2, 1975

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1975–1976

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the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature, by special enactment, has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of 170 distinguished business and professional men and women.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964), Boston-Bouvé College (1964), the College of Criminal Justice (1967), and Lincoln College's daytime Bachelor of Engineering Technology program (1971). As an educational method, the Cooperative Plan enables students to gain valuable practical experience as an integral part of their college program, and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, actuarial science, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. University College offers evening courses — offered by the University since 1906 — and adult-day courses leading to the bachelor's degree. In addition to offering day undergraduate programs in Electrical Engineering Technology and Mechanical Engineering Technology, Lincoln College offers evening/part-time certificate, associate, and bachelor degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the Basic College faculties concerned.

GRADUATE AND PROFESSIONAL SCHOOLS

The ten graduate and professional schools of the University offer day and evening programs leading to the degrees listed.

The Graduate School of Actuarial Science offers the degree of Master of Science in Actuarial Science.

The Graduate School of Arts and Sciences offers the degrees of Master of Arts, Master of Science, Master of Science in Health Science, Master of Public Administration, and Doctor of Philosophy.

The Graduate School of Boston-Bouvé College offers the degree of Master of Science.

The Graduate School of Business Administration offers the degree of Master of Business Administration.

The Graduate Program in Criminal Justice offers the degree of Master of Science.

The Graduate School of Education offers the degree of Master of Education and the Certificate of Advanced Graduate Study.

The Graduate School of Engineering offers the degrees of Master of Science, Engineer degree, Doctor of Engineering, and Doctor of Philosophy.

The School of Law offers the degree of Juris Doctor.

The Graduate School of Pharmacy and Allied Health Professions offers the degrees of Master of Science and Doctor of Philosophy.

The Graduate School of Professional Accounting offers the degree of Master of Science in Accounting.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established in 1960 to relate the University to the needs of its community in a period of accelerated change. Adult education programs offered by the Center and University College have since been consolidated. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

RESEARCH ACTIVITIES

The facilities of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning take place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

DEPARTMENT OF GRADUATE PLACEMENT SERVICES

Counseling and placement services are available to students and alumni of all University programs. A Job Bank of current opportunities located throughout Massachusetts and out of state is maintained, and individual counseling is available. For graduate students enrolled in programs operated on the Cooperative Plan, the Department makes possible an integration of academic work and professional experience in each field of concentration, by referring students to appropriate work assignments.

The Department also offers, on an ongoing basis, a seminar on the technology of job hunting, which teaches participants how to organize an effective job search. The seminar, which has received local and national media coverage in *The Washington Post* and *Newsweek* magazine, and on radio and television, discusses the techniques of building personal referral networks, conducting mail campaigns, and achieving successful interviews, as well as many other valuable tips. By offering the seminar and its other assistance, the Department provides a thorough and vital program of placement services.

buildings and facilities

MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, the Boston Public Library, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 48 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

Ell Student Center

The Carl S. Ell Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

Libraries

The University library system consists of the Dodge Library, which is the main library; the Suburban Campus Library at Bur-

lington; the School of Law Library; and divisional libraries for Physics and Electrical Engineering, Chemistry and Biology, Mathematics and Psychology, Health, Physical, and Recreation Education, and Physical Therapy. There are additional subject collections for the Center for Management Development in Andover, Massachusetts, and the Marine Science Institute in Nahant.

The library collections number 360,000 volumes supplemented by some 267,000 titles in microprint, microfilm, and microfiche forms. The collection includes, in addition, some 3,500 periodical titles, 90,000 documents, and 4,600 sound recordings.

Cabot Physical Education Center

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. The large gymnasium contains four basketball courts. In addition, the Center consists of an athletic cage, a small gymnasium, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouvé College.

A recent addition to the Center, the Barletta Natatorium, houses a 105-foot swimming pool, a practice tank for the crew, handball courts, and shower and dressing facilities.

Dockser Hall

Charles and Estelle Dockser Hall, completed in 1968, houses a large gymnasium, dance studio, motor performance laboratory, college library, community recreation laboratory, folk arts center, dark and music rooms, recreation resources area, locker rooms, offices, classrooms, conference room and lounge, storage facilities, and a research laboratory.

Apartments for Graduate Students

The University maintains a 100-apartment housing unit which accommodates 279 people. Two-, three-, and four-party apartments are available, which vary in size from two to four rooms plus bath. Apartments are furnished with beds, chairs, desks, stove, refrigerator, and kitchen table. The cost includes all utilities.

A $50 deposit is required when making application for the apartments. Applications are available in the Office of University Housing. Students are expected to make such arrangements on a term-to-term basis, but may live in the apartments both while on cooperative work assignments and in school, if they wish. All reservations are made on a first come, first served basis.

SUBURBAN FACILITIES

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

Warren Center

The Warren Center is a practical laboratory for Boston-Bouvé College in outdoor education and conservation, in group practicum, and in camping administration, programming, and counseling. At this Center in Ashland, completed in 1967, there are tennis courts, field hockey and lacrosse fields, waterfront for swimming and boating, overnight camp sites, fields and forests, heated cottages, and the Hayden Lodge with a recreation hall, library, crafts shop, dining facilities, and conference accommodations.

Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

Marine Science Institute

The Marine Science Institute at Nahant, Massachusetts, is a research and instructional facility engaged primarily in studies of marine biology and oceanography. The Institute is operated all year, and is about 20 miles northeast of Boston. Many of the courses at this institute are applicable toward an advanced degree in biology or health science.

college of criminal justice graduate program

The Graduate Program in Criminal Justice at Northeastern University offers both a full- and part-time program leading to a Master of Science degree. Students have the opportunity to choose among three major concentrations of study: administration, policy development, and planning; behavioral science theory; and research. Development of leadership qualities is stressed in each specialization. The purpose of the graduate program is to provide innovative concepts in academic study and research of crime using the criminal justice process.

The master's program in criminal justice concentrates on the problem of crime as a form of deviant behavior through a system established in response to that problem. The multidisciplinary academic program emphasizes a systems approach to criminal justice, and stresses organizational and management theory. Broad in concept, the program is to be understood as encompassing such related disciplines as law, sociology, political science, psychology, criminology, and public administration. Its primary educational function is to prepare individuals for research, teaching, and administration within a changing criminal justice system.

Faculty members represent several academic disciplines. Teaching activities vary in nature and depend on the instructor's specific objectives. Specialized areas include courses in community treatment, delinquency, correctional management, criminology, and criminalistics.

The goals of graduate study in the College of Criminal Justice are:

1. To develop leaders capable of assuming responsibility for policy planning, administration, and group leadership.
2. To prepare individuals for criminal justice teaching positions in community colleges and other educational institutions.
3. To provide students with the necessary skills and knowledge for applied research and to facilitate their ability to discern problem areas.
4. To provide a foundation for advanced doctoral study.

FULL-TIME STUDY

Graduate study in criminal justice may be pursued through either a full- or part-time program. Full-time study allows for completion of course work within one academic year, beginning in September and ending in June of the following year. A substantial portion of the full-time student's time is devoted to academic study. However, simultaneous work on the thesis is expected during this period. Most students finish the thesis requirement in one additional quarter, thereby completing the program within one calendar year.

PART-TIME STUDY

Graduate study is also possible on a part-time basis. The part-time student is allowed to carry a maximum of two courses per quarter. Close consultation with a faculty adviser helps the part-time student determine a workable sequence of courses, and decide the number of credits to be carried each quarter. All degree requirements must be completed within five years from the date of enrollment.

GENERAL REGULATIONS

The general regulations and minimum requirements for all graduate programs are established by the Northeastern University Graduate Council. In some matters the committee of each graduate school is allowed discretion to establish regulations within limits defined by the Council. The regulations and academic requirements which follow have been formulated in accordance with this general policy.

Application

All applicants should address inquiries to the Graduate Program of Criminal Justice. Application forms and information will be mailed promptly.

Registration

Students must register within the period listed on the school calendar. Registration is not permitted after this period.

Residence

All work for advanced degrees must be completed in residence at the University, unless approval has been obtained from the Director of the Graduate Program in Criminal Justice for work taken elsewhere. Students who are in residence and using the facilities of the University must register for such work.

Grading System

The performance of students in graduate courses is recorded by the instructor, using the following grades:

A Excellent
For performance of high graduate caliber

B Satisfactory
For performance at a satisfactory level

C Fair
For performance not at the level expected in graduate work

F Failure
For unsatisfactory performance

I Incomplete
For failure to complete course work

The designation "I" will be changed to a grade upon removal of the deficiencies which caused the "I" to be reported. Deficiencies must be removed within a period stipulated by the professor.

Any student who wishes to take a make-up examination must obtain permission from the professor teaching the course. A reasonable time period for the examination is discussed with and set by the professor.

Class Hours and Credits

All credits at Northeastern University are entered as quarter-hour credits, with a quarter hour of credit being equivalent to three-fourths of a semester hour: i.e., 12 semester hours are equal to 16 quarter hours.

All classes in the Graduate Program in Criminal Justice meet on a quarter basis, with an academic quarter defined as a term of approximately 12 weeks' duration. The academic calendar in the front of this bulletin should be consulted to determine the opening dates of each quarter.

Continuity of Program

Students are expected to maintain continuous progress toward a degree. Any student who does not attend Northeastern for a period of one year must apply for readmission.

Withdrawals

In order to withdraw from a course, a student must fill out an official withdrawal form obtained at the Registrar's Office. Withdrawals may be made through the ninth class meeting of the quarter. Students will be withdrawn as of the date on which they complete the form. Ceasing to attend a class or notifying the instructor does not constitute an official withdrawal. Petitions for withdrawal from a course after the ninth class meeting of the quarter must be submitted to the Director of the Graduate Program, and may be approved to avert unusual hardships on the student.

Students who do not attend the first two sessions will be dropped from the class unless they notify the Registrar of their intention to continue.

Changes in Requirements

The continuing development of the Graduate Program requires occasional revision of curricula. In every new bulletin, some improvements are indicated. When changes impose no hardships on the student and school facilities permit, the student is expected to meet the requirements of the latest bulletin. If the student finds it impossible to meet these requirements, the bulletin for the year in which he entered becomes the binding one.

Application for the Diploma

If a commencement card is not filed with the Registrar's Office on or before the applicable date listed on the calendar, there is no assurance that the degree will be granted in that particular year, even though all other requirements have been fulfilled.

THE MASTER OF SCIENCE DEGREE

Admission Requirements for Degree Candidacy

All applications for graduate study in Criminal Justice are reviewed by the Graduate Admissions Committee and must include:

1. A completed application accompanied by a nonrefundable $15 application fee.

2. Official transcript(s) from accredited institution(s) as evidence of earning a baccalaureate degree with a gradepoint average of approximately 3.0 or higher.
3. Official scores from the aptitude test of the Graduate Record Examination or Law School Aptitude Test; above-average scores are preferred.
4. Three letters of recommendation from academic, professional, or personal sources; academic references are preferred.
5. An essay of not more than 400 words which expresses academic and personal objectives.

No one factor is used to select candidates for the program. The Graduate Admissions Committee receives all applications and considers a variety of factors, including previous work experience and professional potential, in addition to academic record and test scores. When possible, students are asked to participate in an admissions interview to help the Committee make a complete evaluation.

Consideration for admission is given only after all application material, including the $15 application fee, has been received by the Graduate Program in Criminal Justice.

Student Classifications

Students whose credentials meet the criteria listed above are classified as full- or part-time regular students.

Part-time provisional students are individuals who did not meet admission standards but who, in the opinion of the Graduate Committee, have the potential for graduate work. Applicants for full- or part-time regular status whose credentials do not warrant acceptance are automatically considered for part-time provisional status.

Upon completion of 12 quarter hours of course work at Northeastern, the provisional student must request a transfer to regular student status in the Graduate Program. To be considered for transfer, 6 of the 12 credits must be from required courses offered by the Graduate Program in Criminal Justice with a grade of at least B. An overall cumulative grade average of B must be maintained in courses taken outside the College of Criminal Justice.

Special students may take courses on a nondegree basis only by obtaining permission from individual instructors. Should a special student desire admission to the degree program as a regular student, he/she must meet standard admission requirements. Up to 12 credits (no more than two courses per quarter) may be

taken as a special student before applying for admission. All courses must result in a grade of B or better; if 12 credits have been completed, 6 must be from required courses.

Academic Requirements for the Master's Degree

All candidates for the Master's Degree in Criminal Justice are required to complete the following:

1. A total of 42 hours of course credit.
2. Thirty-six of the total 42 hours completed in classroom work, 18 of which are required courses and 18 elective courses.
3. Completion of an acceptable thesis valued at 6 credits.
4. Satisfactory performance on a comprehensive written examination. Full- and part-time students may apply to take the comprehensive examination when they have completed all course requirements.

Students in the program must earn a grade of B or above in all required and elective courses offered within the Graduate Program in Criminal Justice. An average of B or above is also required in all other elective courses taken within the University. Each student is expected to maintain an overall average of B or better in all course work to remain in the program.

Within the above limitations, a criminal justice required or elective course for which a grade of F is received, must be repeated with a grade of B or better, and may be repeated only once. If a grade of F is received in a University elective course, that course may be repeated once to obtain a grade of C or better, or another elective course may be substituted. If a grade of C is received in a required course, provisions may be made with the professor to correct the deficiency.

Program Selection

Upon acceptance as a degree candidate, the student is assigned a temporary adviser in his/her major area of concentration. In consultation with his/her adviser, the student develops a program of study, including program objectives, anticipated courses, and estimated dates of completion of the various degree requirements. The temporary adviser also helps the student select a thesis committee which assists him/her in all academic matters, as well as in the development and completion of the thesis.

Transfer Credits

Individuals who have been enrolled in other graduate degree programs, who have earned a graduate degree, or who have

taken graduate courses on a nondegree basis may be granted credit at the discretion of the Graduate Committee. A maximum of 12 quarter hours of credit from another institution is acceptable providing it meets specified requirements. Courses should be the equivalent of or comparable to courses offered in the Graduate Program in Criminal Justice. If accepted, each course represents 3 quarter hours of credit. A petition for transfer of credit, obtainable from the College of Criminal Justice, together with official transcripts and course descriptions from the institution(s) attended, must be provided before committee action will be taken.

Comprehensive Examination

Each candidate takes a comprehensive examination no later than one month prior to the expected date of graduation. This examination may be taken when the candidate has completed all course requirements, as the subjects tested are commensurate with the student's area of concentration.

A grade of B or better must be achieved in the examination. A student who fails may be given a reexamination under conditions determined by the Director of the Graduate Program or his designate.

Thesis

Each candidate must submit a thesis which exhibits his research ability and increases his scope of individual specialization. The thesis proposal is submitted for approval to the candidate's thesis committee: a chairman and one or two members proposed by the student. Once approved, the thesis committee serves as an advisory board on idea development. The completed thesis must be approved by the thesis committee, graduate committee, and Director of the Graduate Program.

financial information

FINANCIAL OBLIGATIONS

Tuition

Tuition rates and fees are subject to revision by the Board of Trustees at any time. However, any change in tuition and fees will become effective at the beginning of the school year which follows the one in which the change was announced.

Tuition for master's degree candidates and special students is $61 per quarter hour of credit.

Tuition statements are mailed to students by the Bursar's Office and are payable by check to Northeastern University on or before the date specified.

Fees

All applications must be accompanied by a nonrefundable application fee of $15. No application will be processed until the fee has been received by the Graduate Program in Criminal Justice. Checks should be made payable to Northeastern University and sent, with the application, to the Graduate Program in Criminal Justice, Northeastern University, 360 Huntington Avenue, Boston, Massachusetts 02115.

Other fees include a charge of $10 for late payment of tuition and a fee of $25 for all degree candidates, payable before commencement by the applicable date listed on the academic calendar.

Full-time students are charged $12.50 per quarter for the services available in the Student Center; part-time students are charged $.75 a quarter.

All financial obligations to the University must be discharged prior to graduation.

Refunds

Tuition refunds are granted only on the basis of the date appearing on the official withdrawal form filed by the student. Non-attendance does not constitute official withdrawal. Questions regarding refunds should be discussed with the Bursar's Office.

Refunds will be granted in accordance with the following schedule:

Official Withdrawal Filed Within	Percentage of Tuition Refunded
First week of quarter	100
Second week	75
Third week	50
Fourth week	25

FINANCIAL AID

There is a limited amount of financial aid for part-time students enrolled in the Graduate Program in Criminal Justice. Graduate assistantships and/or fellowships in the College are not available to part-time students. A limited number of research fellowships may be available to qualified full-time graduate students. Research fellows are selected on the basis of academic background, research potential, and a written research proposal. Assigned duties require 18-20 hours per week, for which the student receives a stipend of $3450 per calendar year and a tuition waiver.

Martin Luther King, Jr. Scholarships

A limited number of full- and part-time Martin Luther King, Jr. Fellowships are available. These scholarships provide for remission of tuition and all fees, and are awarded to qualified black students on the basis of financial need. Additional information and application forms are available from the Office of Financial Aid.

Dormitory Proctorships

A number of proctorships in men's dormitories on or near the Huntington Avenue Campus are available each year. Appointments carry a minimum compensation of room and board. Further information and application forms may be obtained from the Office of University Housing.

National Direct Student Loan

Under provisions of an act of the Federal government, students carrying an academic load of one-half or more are entitled to loans up to $2,500 for one school year and up to a total of $10,000 for undergraduate and graduate work. The actual amount of any award will be determined on the basis of need and academic promise.

The repayment period begins nine months after the borrower ceases to carry a half-time load and extends ten years from that point at an annual interest rate of three percent. Up to 100 percent may be cancelled for teachers in special education. Additional information and application forms are available from the Office of Financial Aid. The application deadline is September 1 for full-time students, and one month prior to the start of the quarter for which aid is requested, for other students.

Higher Education Loan Plan (Guaranteed Student Loan Plan)

Educational assistance loans may be available from certain banks in the student's home town. These loans, guaranteed by state agencies, carry an interest charge of seven percent, three percent of which is paid by the Federal government. Graduate students may borrow up to $2,500 for each year of study, up to a maximum of $10,000 for both undergraduate and graduate work. Monthly repayment begins nine to twelve months after completion of study, and extends up to five years for amounts less than $2,000 or up to ten years for amounts greater than $2,000. Applicants for this loan are required to complete a need analysis form. Additional information and application forms are available from the Office of Financial Aid.

Law Enforcement Assistance Administration

The Law Enforcement Assistance Administration, U.S. Department of Justice, has set up an Office of Academic Assistance under authority of the Omnibus Crime Control and Safe Streets Act of 1968, Public Law 90-351. Through the University, loans up to $2,200 per year for tuition, and grants up to $250 per academic quarter for tuition and fees are available to law enforcement personnel in undergraduate or graduate programs leading to degrees or certificates in areas directly related to law enforcement.

The loans, limited to full-time students in or preparing for law enforcement or corrections careers, are cancelled at the rate of 25 percent for each year the recipient subsequently serves in law enforcement at federal, state, or local level.

The grants are available to full-time or part-time students employed in a publicly-funded law enforcement agency, and involve a signed agreement to remain in the service of a law enforcement agency employing such applicant, for two years following completion of the course for which aid was given.

Applications for loans or grants should be obtained from the Office of Financial Aid, Room 252 Richards Hall.

Please note: Aid granted from programs sponsored by the Federal government is dependent upon the amount of funds allocated to Northeastern. The University does not award financial assistance in any form to non-citizens of the United States.

faculty

GRADUATE TEACHING FACULTY AND STAFF OF THE COLLEGE OF CRIMINAL JUSTICE

Ames, Lois, B.A., M.A., A.C.S.W. certified, *Assistant Professor of Criminal Justice*

Croatti, Robert, B.S., *Assistant to the Dean of Criminal Justice*

Cunliffe, Frederick, B.S., M.S., Ph.D., *Professor of Criminal Justice*

Deming, Romine, B.A., M.S., Ph.D., *Associate Professor of Criminal Justice*

Fuller, Robert, B.S., M.S., *Administrative Assistant, Graduate Program in Criminal Justice*

Flynn, Edith, B.A., M.A., Ph.D., *Associate Professor of Criminal Justice*

Gallati, Robert, B.S., L.L.B., L.L.M., D.J.S., *Professor of Criminal Justice*

Kassler, Haskell, B.A., J.D., *Assistant Professor of Criminal Justice*

Natoli, Richard, B.S., M.A., *Assistant Professor of Criminal Justice*

Reed, James, B.F.A., M.A., *Assistant Professor of Criminal Justice*

Rosenblatt, Norman, B.A., M.A., Ph.D., *Dean of the College of Criminal Justice, Director of the Graduate Program in Criminal Justice*

Schafer, Stephen, D. Jur., Prof. Agrégé, *Professor of Criminal Justice*

Senna, Joseph, B.A., M.S.W., J.D., *Associate Professor of Criminal Justice*

Sheehan, Robert, B.A., M.A., *Professor of Criminal Justice*

Siegel, Larry, B.A., M.A., *Assistant Professor of Criminal Justice*

Turek, Donna, B.A., M.A., *Assistant Professor of Criminal Justice*

UNIVERSI

fields of study

PROGRAMS IN PROFESSIONAL SPECIALIZATIONS

Master of Science

The master's curriculum is divided into two categories of major concentration: (1) Criminal Justice Administration Planning and Development, and (2) Behavioral Science Theory and Research. Model and specimen programs for each concentration can be found on pages 39-41 in this bulletin. Students must choose one of the two concentrations and complete one of the programs outlined in the following pages.

Group I Core Curriculum (18-20 credits)

This group consists of all required graduate courses offered and taught by the faculty of the College of Criminal Justice. Core courses are taken by all students regardless of major concentration or elective interest. *Students interested in Behavioral Science Theory are required to take one additional core course, Juvenile Justice and Delinquency, making a total of 21 credits of core courses.* The core curriculum encompasses a broad area of topical information, and comprises a solid foundation for graduate study in criminal justice.

Course	
Administration of Criminal Justice	3
Theories in Criminology	3
Legal Issues in Criminal Justice	3
Criminal Justice Planning and Development	3
Statistical Analysis	3
Research Methods in Criminal Justice	3
	18 credits

cont.

Juvenile Justice and Delinquency	3
(TO BE TAKEN BY STUDENTS CONCENTRATING IN BEHAVIORAL SCIENCE THEORY)	21 credits
THESIS	6
	27 or 24 credits
Elective Courses	15 or 18
TOTAL PROGRAM	42 credits

Group II

The following is a list of elective courses offered and taught by the faculty of the Graduate Program in Criminal Justice. These courses involve specific problems of crime and criminal justice, while the required courses are more general in nature and emphasize the comprehensive systems approach to criminal justice.

Course	
Conflict Management in Criminal Justice	3
Deviance, Stigma, and Justice	3
Correctional Services in the Community	3
Penology	3
Juvenile Justice and Delinquency	3
Forensic Science	3
Research Methods II	3
Field Practicum	3

Group III Elective Curriculum

Elective courses offered by and taught in the following graduate programs may be credited toward meeting degree requirements for the Master of Science in Criminal Justice:

Graduate School of Arts and Sciences
Graduate School of Business Administration
School of Law
Graduate School of Professional Accounting
Graduate School of Engineering
Graduate School of Education
Graduate School of Pharmacy and Allied Health Professions
Graduate School of Boston Bouvé College

MODEL PROGRAM

MASTER'S DEGREE PROGRAM IN CRIMINAL JUSTICE

QUARTER I

Course	Credits
Administration of Criminal Justice	3
Theories in Criminology	3
Statistical Analysis	3
Criminal Justice Planning and Development	3
Total	12

QUARTER II

Course	Credits
Research Methods I	3
Legal Issues in Criminal Justice	3
Juvenile Justice and Delinquency	3
Elective	3
Total	12

QUARTER III

Course	Credits
Elective	3
Elective	3
Elective	3
Elective	3
Total	12

SUMMARY

	Credits
Thesis	6
Required Courses in Criminal Justice	21
Electives from Criminal Justice and University	15
TOTAL	42

SPECIMEN PROGRAM I

MAJOR CONCENTRATION

Administration, Policy Development, and Planning

QUARTER I

Course	Credits
Administration of Criminal Justice	3
Theories in Criminology	3
Statistical Analysis	3
Criminal Justice Planning and Development	3
Total	12

QUARTER II

Course	Credits
Research Methods I	3
Legal Issues in Criminal Justice	3
Criminal Justice Elective	3
Functions and Techniques of Public Management (22.874)	3
Total	12

QUARTER III

Course	Credits
Criminal Justice Elective	3
Criminal Justice Elective	3
Urban Sociology (21.885)	3
Organization and Administrative Theory (50.953)	3
Total	12

SUMMARY

	Credits
Thesis	6
Required Courses in Criminal Justice	18
Elective Courses in Criminal Justice	9
Elective Courses from University	9
TOTAL	42

SPECIMEN PROGRAM II

MAJOR CONCENTRATION

Behavioral Science Theory and Research

QUARTER I

Course	Credits
Administration of Criminal Justice	3
Theories in Criminology	3
Statistical Analysis	3
Criminal Justice Planning and Development	3
Total	12

QUARTER II

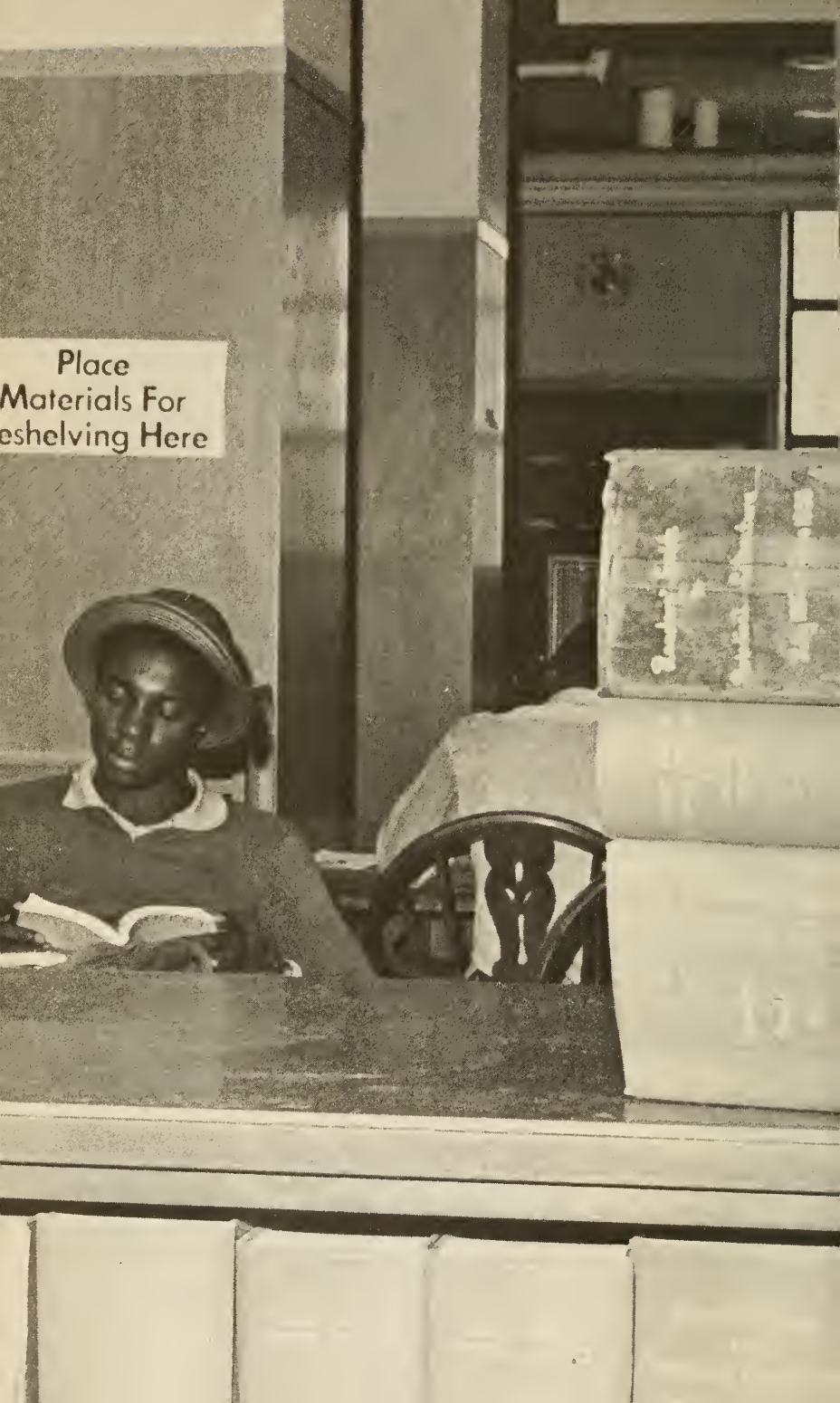
Course	Credits
Research Methods I	3
Legal Issues in Criminal Justice	3
Juvenile Justice and Delinquency	3
Personality and Social Structure (50.805) or Operations Research for Criminal Justice	3
Total	12

QUARTER III

Course	Credits
Criminal Justice Elective	3
Criminal Justice Elective	3
Foundations of Social Theory (21.805) or Research Methods II	3
Social Psychology I (19.920) or Introduction to Data Processing	3
Total	12

SUMMARY

	Credits
Thesis	6
Required Courses in Criminal Justice	21
Elective Courses in Criminal Justice	6
Elective Courses from University	9
TOTAL	42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courses

DESCRIPTION OF COURSES

All courses carry three quarter hours of credit unless otherwise specified.

92.904 Administration of Criminal Justice

A description and analysis of the criminal justice process from prevention and arrest to release after incarceration. Concentration is on a systems approach to understanding criminal behavior. The philosophies, practices, and procedures of agencies responsible for the administration of justice are viewed and critical efforts made to deal with the effectiveness of different approaches to crime control.

92.907 Theories in Criminology

The history and development of criminological theories from ancient to contemporary times. It examines the assumptions of theoretical models and relates them to the development of criminal policies. Psychological, sociological, and cultural theories underlying deviant criminal behavior are reviewed.

92.910 Nature and Extent of Crime

An extensive examination of the nature and volume of crime in the U.S. and foreign countries. Course content includes types of crimes and offenders, geographic distribution of crime patterns, cost of crime, and a critical review of techniques used to measure crime.

92.913 Criminal Justice Planning and Development

Introduction to planning techniques and their impact on criminal justice program development, now and in the future. Policy and decision-making procedures pertaining to affiliated agencies and organizations are analyzed. The extent of planning for crime control on local, state, regional, and national level is studied. The peculiar nature of urban crime problems in relation to planning is also reviewed. Planning involves identification of problem areas, diagnosing causation, formulating solutions, alternative strategies, and mobilizing resources necessary to effect change in the system.

92.916 Statistical Analysis

An analysis of the application of statistics in research, and the basic assumptions underlying statistical procedures. The course covers descriptive and inferential statistical procedures such as sampling, laws of probability theory, hypothesis testing, analysis of variance, and multiple regression.

(Students with a background in statistics may make a special request to replace this course with an elective.)

92.957 Research Methods in Criminal Justice I

Survey of methods and approaches utilized for independent research, as well as the evaluation of existing criminal justice programs. It considers research methods and empirical findings through assigned research techniques including design, instrument construction, data processing, and analysis interpretation.

92.958 Research Methods in Criminal Justice II

Advanced research design problems are examined. Criminal justice programs are evaluated quantitatively, with concentration placed on coding, schedule construction, sampling theory, and statistical models measuring causation.

92.841 Criminal Law

General principles of the criminal law, including the concept of responsibility for crimes, limitations on capacity, and basic elements of crimes. The sources and purposes of criminal law are analyzed, and different conceptions of crime and current law reform are discussed.

92.800 Law Enforcement Practices

This course involves a study of the current theory and practices in the field of law enforcement. Major probiems which confront the law enforcement process are considered, as well as the methods now used by law enforcement agencies.

92.804 Correctional Services in the Community

An analysis of treatment and supervisory activities, including probation and parole for offender groups while in the community. There is a thorough exploration of community resources and services such as vocational rehabilitation, welfare services, mental health clinics, employment services, and legal aid. Effectiveness of community treatment is examined through case studies.

92.810 Penology and Corrections

This course deals essentially with the process of incarceration and the social structure of the prison community. Consideration is given to management, operation effects, and the effectiveness of different institutions. Modern correctional approaches and current rehabilitation practices are also discussed.

92.816 Social Deviance

Crime as a form of social deviance is studied through intensive reading of a wide range of sociological literature on deviant behavior and its relationship to crime. Included are relevant selections from Durkheim, Merton, Cohen, Goffman, Becker, Matza, Ohlin, and Schur.

92.851 Juvenile Justice and Delinquency

A study of the juvenile justice system from community concern to the subsequent disposition. The class analyzes juvenile and family court procedures and questions of jurisdiction. Various theories of delinquency developed from law, sociology, psychology, and related disciplines are also covered.

92.822 Forensic Science

The development of forensic science is summarized according to its effects on the criminal justice system. Lecture and laboratory work examine various ways the physical sciences contribute to the establishment of scientific criminal evidence. Designed primarily for students who plan to enter a profession requiring an understanding of criminalistics.

92.828 Field Practicum

Field instruction in a criminal justice agency where the instruction may be given in administration, research, teaching, and/or related activities. Students have the opportunity to apply theoretical concepts in a practical, applied fashion by observing and contributing to the daily activities of operating agencies and organizations.

92.860 Conflict Management in Criminal Justice

An examination of problems in conflict management. Concepts and definitions of social conflict, and comparisons between functional and dysfunctional conflict are explored. Inquiries into representative conflict management strategies and techniques are made, which afford the opportunity to relate general theory and research results to practical situations of criminal justice conflict management. A variety of heuristic techniques is anticipated, such as: scenarios, roleplaying, and use of audiovisual media.

92.809 Deviance, Stigma, and Justice

Stigmatization is accurately defined as it is found to exist in different segments of our society. Its history in the United States is traced through examples of specific topics, such as: employment of ex-offenders, social acceptance of mental patients, ethnic discrimination, and homosexuality.

92.806 Conflicting Values and the Criminal Justice System

An investigation of ideologies, institutions, and ethnic mores as they affect black values and reactions to the criminal justice system. Integration, rebellion, and institutionalization are subjects of discussion.

92.830 History of Police in the United States

A review of the history of police activities in the United States, emphasizing black community relations. The study of previous policy provides a broad, revealing perspective from which to view contemporary departments. From this framework, the class analyzes societal expectations of the police.

92.808 Criminal Behavior, Psychiatry, and the Public

An introduction to the field of psychiatric criminology which exam-

ines the known psychological sources of criminal behavior. Psychiatric concepts are applied to crime prevention, the examination and rehabilitation of the offender, and the legislative process.

92.862 Drug Abuse, Mental Health, and the Public

An introductory course concerning drug abuse. The mental health and medico-legal aspects of the problem are emphasized by concentrating on the areas of prevention and rehabilitation, public attitudes on drug abuse, and drug abuse education.

92.905 Legal Issues in Criminal Justice

An in-depth study of contemporary legal questions faced by criminal justice professionals. Emphasis is placed on constitutional probems, and the judicial review of administrative decisions made by criminal justice organizations. Topics to be considered are: selected provisions of the United States Constitution with particular emphasis on amendments 4, 5, 6, and 14; questions of electronic surveillance; right to counsel; line-up, bail, and right to speedy trial; sentencing; legal aspects of probation and parole; and prisoners' rights.

92.808 Criminal Behavior, Psychiatry, and the Public

An introduction to the field of psychiatric criminology. Examines current knowledge of the psychological sources of criminal behavior and the application of psychiatric concepts to the area of crime prevention, the examination and rehabilitation of the offender, and the legislative process.

92.812 Management Issues in Law Enforcement

An analysis of controversial issues confronting the law enforcement administrator in determining policy and directing procedures. Current and planning practices are critiqued from the standpoint of rapidly accelerating innovation and a changing value system.

92.811 Contemporary Problems in Corrections

A seminar focusing on the current crisis facing the American correctional system. It is designed to provide the student with a working perspective on some of the most salient issues in the field today: to critically reexamine the important precepts for corrections which have heretofore been treated as given; to analyze

contemporary problems in the light of corrections relationship to the other components of the criminal justice system; to explore avenues to more effective ways to deal with alleged and convicted offenders. The theoretical focus and general perspective of the seminar is sociological.

92.801 The Ombudsman

An examination of the concept of the ombudsman as an intervenor for justice. The ombudsman, as a government official to check on government, is an established post in several European countries, particularly Scandinavia. In this country ombudsmen have already appeared in such diverse institutions as hospitals, city halls, prisons, and universities, and a number of states have established ombudsman offices. It has been urged that ombudsmen are needed at the various levels of American government. Massachusetts considered two ombudsman bills in this session of the legislature: One would create the Office of Ombudsman for Corrections; the other would create the Office of Residential Care Ombudsman for the Commonwealth. In this course, the readings and lectures will be supplemented by the appearance of knowledgeable guest speakers if possible.

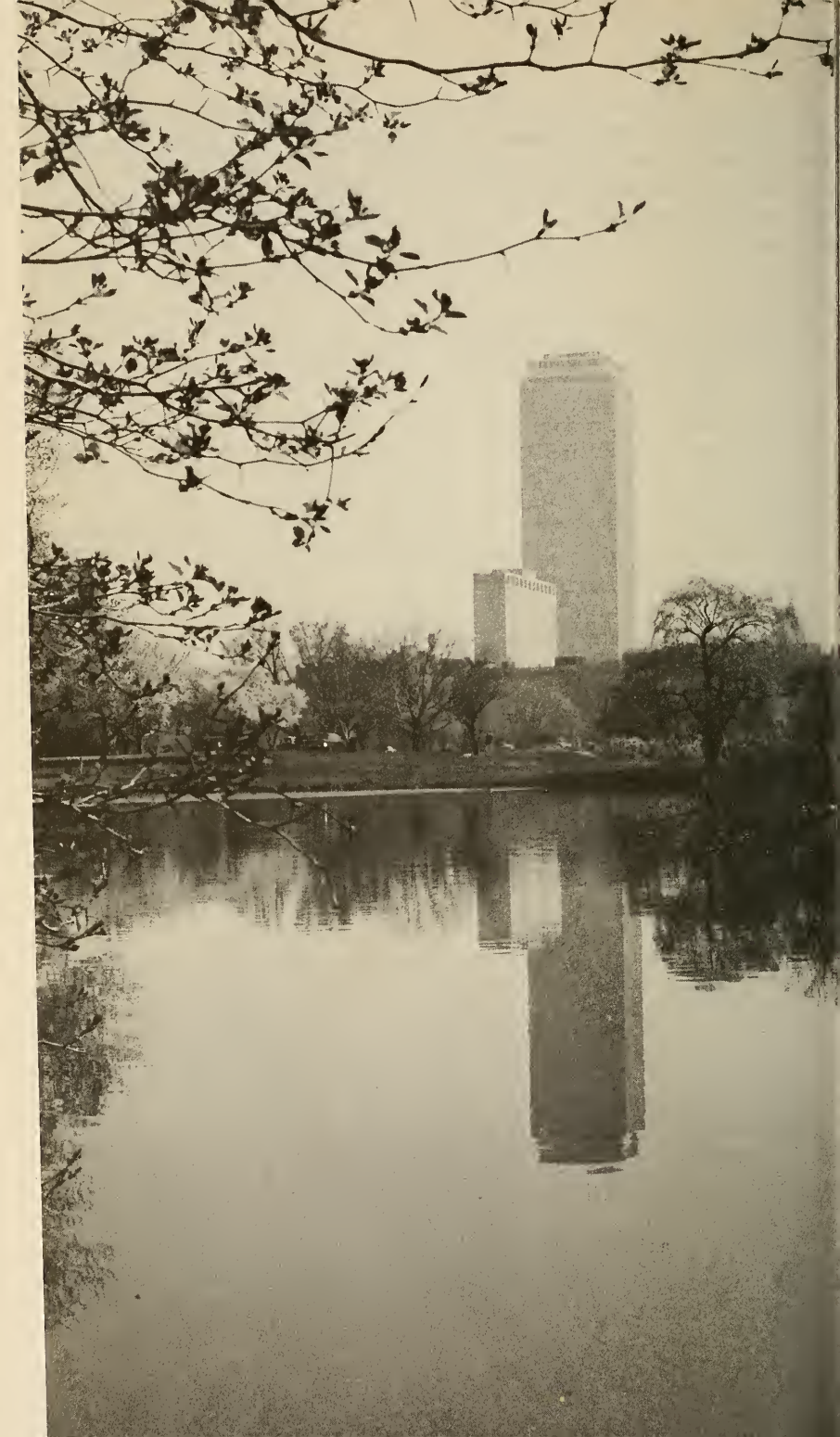
92.813 Correctional Administration

Concentration is on a general systems approach to organizational design and management in corrections. The major focus of the course is on the application of the managerial process, which places emphasis on the organization's totality, regarding it as "an organized or complex whole." As such, the general system approach views an organization's subsystems as secondary in importance to the primary system, and as mutually interdependent, and holds, as axiomatic, that subsystems cannot be altered without affecting other subparts of the whole. It is the object of the course to critically examine the organization and administration of the "corrections system" within and among the various political jurisdictions of the United States; to analyze administrative practices; to determine those processes which may encourage, facilitate, and develop more effective, efficient, innovative, economical, and humane organizational systems in corrections.

92.815 Deviance and Criminal Justice

A critical examination of existing theories about deviant behavior —crime, juvenile delinquency, substance abuse, mental illness, homosexuality, and prostitution—; how they are used as general-

ized ways to approach deviance, and their possible implications for the development of a more comprehensive, general theory of deviant behavior. The relationship of social control to deviance, from purely reciprocal societal reactions to deviance to social control as an independent or "causal" variable of various forms of individual and social deviation, will be explored.



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graduate school of education
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ACCREDITED MEMBER

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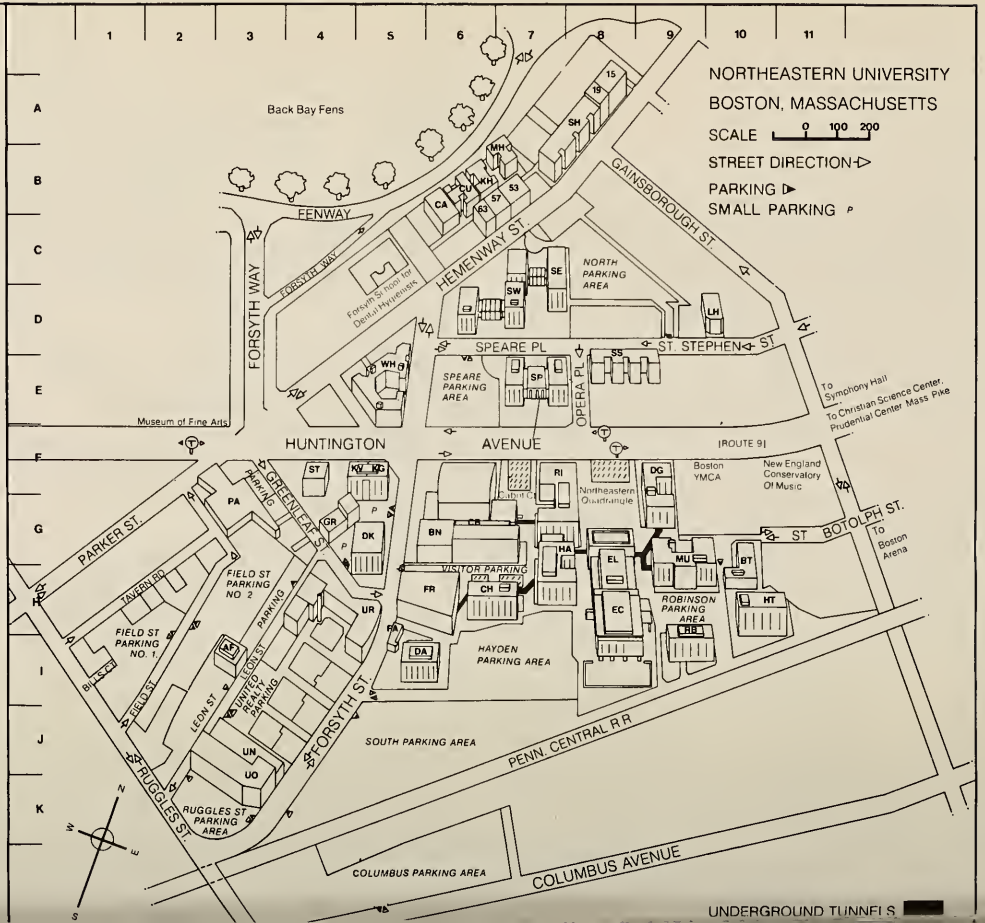
Academic and Service Buildings	Map Code	Bldg. Code
African-American Institute	I3	AF
Barletta Natatorium	G6	BN
Botolph Building	G10	BT
Cabot Physical Education Center	G6	CB
Cahners Hall	C6	CA
Churchill Hall	H6	CH
Cooperative Education Building	F4	ST
Cushing Hall	B6	CU
Dana Research Center	I5	DA
Dockser Hall	G5	DK
Dodge Library	G9	DG
Ell Student Center (Auditorium section)	G8	EL
Ell Student Center (Student Lounge section)	H8	EC
Forsyth Building	H6	FR
Forsyth Building Annex	H5	FA
Greenleaf Building	G4	GR
Hayden Hall	G7	HA
Hurtig Hall	H11	HT
Kerr Hall (Faculty Center)	B6	KH
Knowles Center (Gryzmish Hall section)	F5	KG
Knowles Center (Volpe Hall section)	F5	KV
11 Leon Street	J3	UO
15 Leon Street	J3	UN
Mugar Life Sciences Building	G9	MU
Parker Building	G3	PA
Richards Hall	F7	RI
Robinson Hall	H10	RB
United Realty Building	H5	UR
Dormitories		
115 Hemenway Street	A8	15
119 Hemenway Street	A8	19
153 Hemenway Street	B7	53
157 Hemenway Street	B6	57
163 Hemenway Street	C6	63
Kerr Hall	B6	KH
Light Hall	D10	LH
Melvin Hall	B7	MH
106-122 St. Stephen Street	E8	SS
Smith Hall	B8	SH
Speare Hall	E7	SP
Stetson Hall East	C7	SE
Stetson Hall West	D7	SW
White Hall	E5	WH



ACADEMIC CALENDAR 1976—1977

Fall Quarter 1976

Registration period		
Burlington	Tuesday—Wednesday	Sept. 14—15
Boston	Monday—Thursday	Sept. 20—23
Classes begin	Monday	Sept. 27
Examination period	Monday—Saturday	Dec. 13—18

Winter Quarter 1976—1977

Registration period		
Burlington	Tuesday	Nov. 30
Boston	Monday—Thursday	Dec. 6—9
Classes begin	Monday	Jan. 3
Examination period	Monday—Saturday	Mar. 21—26

Spring Quarter 1977

Registration period		
Burlington	Tuesday	Mar. 8
Boston	Monday—Thursday	Mar. 14—17
Classes begin	Monday	Apr. 4
Last day to file card for		
Spring Commencement	Friday	Apr. 1
Last day to pay fee for		
Spring Commencement	Friday	Apr. 29
Final grades due in Registrar's		
Office for June graduates	Friday	June 3
Examination period	Monday—Saturday	June 13—18
Spring Commencement	Sunday	June 19

Summer Quarter 1977

Registration period		
Burlington	Monday—Tuesday	June 13—14
Boston	Wednesday—Thursday	June 15—16
Classes begin	Monday	June 27
Last day to file card for		
Fall Commencement	Friday	July 1
Last day to pay fee for		
Fall Commencement	Monday	Aug. 1
Examination period	Wednesday—Thursday	Aug. 3—4

UNIVERSITY HOLIDAYS 1976—1977

Columbus Day	Monday	October 11
Veterans' Day	Thursday	November 11
Thanksgiving Recess	Thursday—Saturday	November 25—27
Christmas Vacation	Monday—Saturday	Dec. 20—Jan. 1
Martin Luther King Day	Saturday	January 15
Washington's Birthday	Monday	February 21
Patriot's Day	Monday	April 18
Memorial Day	Monday	May 30
Independence Day	Monday	July 4
Labor Day	Monday	September 5

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admissions, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or on the basis of being a handicapped but otherwise qualified individual. In addition, Northeastern takes affirmative action in the recruitment of students and employees.

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University Graduate Council
1976—1977

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the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of 178 distinguished business and professional men and women.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964); Boston-Bouvé College (1964); the College of Criminal Justice (1967); and by Lincoln College's daytime Bachelor of Engineering Technology program (1971). This educational method enables students to gain valuable practical experience as an integral part of their college program and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, actuarial science, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. University College offers evening courses—offered by the University since 1906—and adult-day courses leading to the bachelor's degree. In addition to offering day undergraduate programs in Electrical Engineering Technology and Mechanical Engineering Technology, Lincoln College offers evening/part-time certificate, associate, and bachelor degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the Basic College faculties concerned.

GRADUATE AND PROFESSIONAL SCHOOLS

The ten graduate and professional schools of the University offer day and evening programs leading to the degrees listed.

The Graduate School of Actuarial Science offers the degree of Master of Science in Actuarial Science.

The Graduate School of Arts and Sciences offers the degrees of Master of Arts, Master of Science, Master of Science in Health Science, Master of Public Administration, and Doctor of Philosophy.

The Graduate School of Boston-Bouvé College offers the degree of Master of Science.

The Graduate School of Business Administration offers the degree of Master of Business Administration.

The Graduate School of Criminal Justice offers the degree of Master of Science.

The Graduate School of Education offers the degrees of Master of Education and Doctor of Education and the Certificate of Advanced Graduate Study.

The Graduate School of Engineering offers the degrees of Master of Science, Engineer degree, Doctor of Engineering, and Doctor of Philosophy.

The School of Law offers the degree of Juris Doctor.

The Graduate School of Pharmacy and Allied Health Professions offers the degrees of Master of Science and Doctor of Philosophy.

The Graduate School of Professional Accounting offers the degree of Master of Science in Accounting.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established in 1960 to relate the University to the needs of its community in a period of accelerated change. Adult education programs offered by the Center and University College have since been consolidated. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

RESEARCH ACTIVITIES

The facilities of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning take place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

buildings and facilities

MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, the Boston Public Library, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 47 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

Ell Student Center

The Carl S. Ell Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

Libraries

The University library system consists of the Dodge Library, which is the main library; the Suburban Campus Library at Burlington; the School of Law Library; and divisional libraries for Physics and Electrical Engineering, Chemistry and Biology, Mathematics and Psychology, and Health, Physical and Recreation Education, and Physical Therapy. There are additional subject collections for the Center for Management Development at Andover, Massachusetts, and the Marine Science Institute in Nahant.

The library collections number 400,000 volumes supplemented by some 333,000 titles in microprint, microfilm, and microfiche forms. The collection includes, in addition, some 3,700 periodical titles, 100,000 documents, and 4,600 sound recordings.

Cabot Physical Education Center

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. The large gymnasium contains four basketball courts. In addition, the Center consists of an athletic cage, a small gymnasium, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouvé College.

A recent addition to the center, the Barletta Natatorium, houses a 105-foot swimming pool, a practice tank for the crew, handball courts, and shower and dressing facilities.

Dockser Hall

Charles and Estelle Dockser Hall, completed in 1968, houses a large gymnasium, dance studio, motor performance laboratory, college library, community recreation laboratory, folk arts center, dark and music rooms, recreation resources area, locker rooms, offices, classrooms, conference room and lounge, storage facilities, and a research laboratory.

Apartments for Graduate Students

The University maintains a 100-apartment housing unit which accommodates 279 people. Two-, three-, and four-party apartments are available which vary in size from two to four rooms plus bath. Apartments are furnished with beds, chairs, desks, stove, refrigerator, and kitchen table. The cost includes all utilities.

A $100 deposit is required when making application for the apartments. Applications are available in the Office of University Housing. Students are expected to make such arrangements on a term-to-term basis but may live in the apartments both while on cooperative work assignments and in school if they wish. All reservations are made on a first come, first served basis.

SUBURBAN FACILITIES

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

Warren Center

The Warren Center is a practical laboratory for Boston-Bouvé College in outdoor education and conservation, in group practicum, and in camping administration, programming, and counseling. At this Center in Ashland, completed in 1967, there are tennis courts, field hockey and lacrosse fields, waterfront for swimming and boating, overnight camp sites, fields and forests, heated cottages, the Hayden Lodge with a recreation hall, library, crafts shop, dining facilities, and conference accommodations.

Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

Marine Science Institute

The Marine Science Institute at Nahant, Massachusetts, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated all year, and is about 20 miles northeast of Boston. Many of the courses at this institute are applicable toward an advanced degree in biology or health science.

Brockton, Nashua, and Framingham Campuses

For students residing in southeastern Massachusetts and northeastern Rhode Island, the Graduate School of Business Administration offers a major portion of its M.B.A. Program at facilities in Brockton, Massachusetts. These facilities, made available by the Veterans Administration Hospital, are conveniently located just off Route 24.

Students residing in the southern New Hampshire area may take a major portion of the M.B.A. Program at facilities in Nashua, New Hampshire. These facilities are furnished by Sanders Associates, Inc. and are located in their headquarters on Route 3, just over the Massachusetts line.

For students in the Framingham-Worcester area, a major portion of the M.B.A. Program may be taken at classroom facilities located in Framingham, Massachusetts.

the graduate school of education

The Graduate School of Education provides programs leading to the Master of Education degree for in-service educators who wish to pursue a specialization and for individuals who wish to pursue the special areas of study indicated below. A nondegree program for those who wish certification as elementary or secondary teachers is also offered.

Individuals who possess or are eligible for teaching certificates may earn the Master of Education degree in the areas of curriculum and instruction, early childhood education, elementary and secondary administration, emotional disturbance, generic special educator, instructional technology, occupational education, mental retardation, severely handicapped, and early childhood handicapped.

Those individuals who do not possess a teaching certificate may specialize in the areas of career education college counseling, community counseling, cooperative education, rehabilitation counseling, school counseling, educational research, human development, rehabilitation administration, speech pathology or audiology, and special education community personnel.

Programs of study leading to the Certificate of Advanced Graduate Study in the areas of counseling, educational administration, rehabilitation, and special education are offered to those individuals who presently hold a master's degree.

The Graduate School of Education also offers a Doctor of Education (Ed.D.) program in Leadership: Administration and Supervision. Being offered jointly by the Departments of Counselor Education, Educational Administration, and Special Education and Rehabilitation Administration, students may concentrate in the areas of: school administration, rehabilitation administration, pupil personnel administration, student personnel administration, administration of higher education, administration of cooperative education, and special education administration. Students must hold a master's degree in order to apply to this program.

GENERAL REGULATIONS

The general regulations and minimum requirements for all graduate programs are established by the Northeastern University Graduate Council. In some matters the committee of each graduate school is allowed discretion to establish regulations within limits defined by the council. The regulations and academic requirements which follow have been formulated in accordance with this general policy.

Registration

Students must register within the period listed on the school calendar. Time and place of registration will be announced prior to each period.

Residence

All work for advanced degrees must be completed at the University unless approval has been obtained from the Director of the Graduate School for work taken elsewhere. Students who are in residence and are using the facilities of the University must register for such work.

Grading System

The performance of students in graduate courses will be recorded by the instructor by use of the following grades:

A Excellent
This grade is given to those students whose performance in the course has been of very high graduate caliber.

B Satisfactory
This grade is given to those students whose performance in the course has been at a satisfactory level.

C Fair
This grade is given to those students whose performance in the course is not at the level expected in graduate work.

F Failure
This grade is given to those students whose performance in the course is unsatisfactory.

In addition, the following letter designations are used:

I Incomplete
This grade is given to those students who fail to complete the work of the course.

L Audit without credit.

S Satisfactory without quality designation.

U Unsatisfactory without quality designation.
These two grades are used for the first quarter of a two-quarter sequence in which the grade for the second quarter applies to both the first and second quarters of the sequence.

The I grade will be changed to a letter grade upon removal of the deficiency which caused the grade of I to be reported. Deficiencies must be made up within the quarter following that for which the grade of I is received unless an extension of time is granted by the instructor. However, such extension of time may not exceed two additional consecutive calendar quarters.

Any student who wishes to take a final make-up examination must obtain permission of the Director of the Graduate School by the second week of the quarter succeeding that in which the examination was missed. The

make-up examination must be taken in that succeeding quarter unless circumstances warrant permission of the Director to defer it to one of the next two quarters.

Auditing

A student may audit a course without credit by obtaining, prior to registration, the written approval of the instructor of the course involved and by presenting this permit at the Office of the Graduate School of Education. No change either to or from the audit status may be made after the first day of classes. Tuition for an audit course is the same as for a course taken for credit.

Class Hours and Credits

All credits are entered as quarter hours. A quarter hour of credit is equivalent to three-fourths of a semester hour credit. The academic calendar at the front of this bulletin should be consulted in order to determine the opening and closing dates of each quarter. It should be noted that most classes meet either in the late afternoon or evening.

Continuity of Program

Students are expected to maintain continuous progress toward a degree. Any student who has been admitted to a degree program, has completed at least one course, but has not attended for a period of one year, must notify the Office of the Graduate School of Education prior to additional registration. In addition, he must meet with his program adviser to make any necessary program adjustments.

Withdrawals

In order to withdraw from a course, a student must fill out an official withdrawal form obtained at the Registrar's Office or at the Burlington Campus Office. Withdrawals may be made through the ninth week of the quarter. Students will be withdrawn as of the date on which they fill out the form. Ceasing to attend a class or notifying the instructor does not constitute an official withdrawal. See section on financial information for information on refunds.

Changes in Requirements

The continuing development of the graduate school forces frequent revision of curricula. In every new bulletin some improvements are indicated. When no hardship is imposed on the student because of changes, and when the facilities of the school permit, the student is expected to meet the requirements of the latest bulletin. If the student finds it impossible to meet these requirements, the bulletin for the year in which he entered becomes the binding one.

Application for the Degree

If a commencement card is not filed with the Registrar's Office on or before the applicable date listed on the calendar, there is no assurance that the degree will be granted in that particular year even though all other requirements have been fulfilled.

Honor Society

Northeastern University has on campus the Kappa Zeta Chapter of Kappa Delta Pi. A national honor society in education, Kappa Delta Pi was founded in 1911 at the University of Illinois. Kappa Zeta Chapter was installed on May 29, 1964.

To be considered for membership, graduate students must be degree candidates in the College of Education and have completed at least six courses (24 quarter hours) with a cumulative average of at least 3.5, and have no C grades on their graduate records.

Applications for membership and further information may be received from the Office of the Dean, College of Education, Northeastern University, Boston, MA 02115.

Supporting Services

The College of Education operates or coordinates with other agencies in the operation of certain bureaus, clinics, and offices which support and enrich the academic programs. Graduate students may find some of these services to be of interest and assistance while others may be suggested as sources of information or practical experiences. Among these services are those discussed in the following paragraphs.

The Bureau of Educational Field Services, located in Cushing Hall (102 The Fenway), provides a wide variety of offerings to our graduate students as well as to school systems and other educational agencies throughout New England. These offerings include special off-campus programs for our graduate students, both credit and noncredit; credit and noncredit in-service training for professional school personnel, offered in local communities; special noncredit workshops for parent and para-professional groups; and program evaluation, research projects, surveys, educational planning services, and consultant services.

Anyone interested in obtaining more information about the Bureau should contact the Office of the Director of the Bureau at 617-437-3298, or visit 118 Cushing Hall.

Northeastern University's Speech and Hearing Clinic, located in 133 Forsyth Building, provides diagnostic and therapeutic services for both University students and school-age community children insofar as staff and facilities allow. The Clinic is accredited by the Professional Services Board of the American Speech and Hearing Association.

The Resources Laboratory (formerly the Curriculum Library), located in Cahners Hall (104 The Fenway), contains a variety of materials and

resources relating to a large number of programs and task areas of elementary and secondary schools. Use of this facility is limited to staff and students of the College of Education.

Northeastern University's Reading and Learning Clinic, located in Cahners Hall, provides diagnostic and corrective services in reading for both University students and school-age community children insofar as staff and facilities allow.

The New England Rehabilitation Research Institute, located in the United Realty Building, conducts rehabilitation studies on the problems of motivation and dependency and publishes reports pertaining to the area of rehabilitation. A materials resources library in rehabilitation research is housed in the same building as the Department of Rehabilitation and Special Education.

The Center for Educational Development, located in Cushing Hall, works with community agencies in developing and implementing innovative educational programs, particularly in areas, both urban and rural-isolated, which lack substantial financial resources.

In addition, the College of Education utilizes the resources, materials, and facilities of other University-wide bureaus such as the Office of Educational Resources, an important component of which is the Center for Programmed Instruction.

financial information

FINANCIAL OBLIGATIONS

Tuition

Tuition for master's degree candidates, CAGS candidates, doctoral candidates, and special students is $55 per quarter hour of credit. Tuition for audited courses is the same as for courses taken for credit. There is a special tuition charge of $600 for the following: 51.805, Student Teaching; 51.873 and 51.875, Reading Clinic I & II; 53.805-806, Counseling Practicum; 53.840-841, Advanced Field Work; 53.843-844, School Psychology Field Work; 55.813, Advanced Clinical Practice; 56.850-851, Field Work and Student Teaching; 56.853-854, Field Work and Practicum; 56.960, Practicum in Rehabilitation Administration; 93.802-803, Practicum in Early Childhood Education I & II; Thesis; 55.852, Practicum, Teaching of the Deaf.

There is a special tuition charge of $325 for the following: 52.843, Administrative Internship; Counselor Education Interns enrolled in the Boston School System.

The tuition charge for the doctoral dissertation is $500, to be paid when registration is made for the dissertation. At the completion of formal course work for the doctorate, a dissertation continuation fee of $50 per quarter will be charged until completion of the dissertation.

Tuition statements are mailed to students by the Bursar's Office and are payable by check to Northeastern University on or before the date specified.

Tuition rates and fees are subject to revision by the Board of Trustees at any time.

Fees

An Application Fee of $15 (nonrefundable) is charged to all students when they apply for admission to the Graduate School of Education. No application papers will be processed until this fee has been received. Checks should be made payable to Northeastern University and sent to the Graduate School of Education, 102 The Fenway, Boston, Mass. 02115.

Other fees include a charge of $10 for late payment of tuition; a fee of $2 for deferred tuition (with approval of Bursar); a final examination make-up fee of $5; a fee of $25 for all degree candidates, payable before commencement by the applicable date listed on the academic calendar.

For full-time students there is a charge of $12.50 per quarter for the services available in the student center. The fee for teaching assistants and

research fellows is $6.25 each quarter. All part-time students on the Huntington Avenue campus are charged $.75 a quarter.

All full-time students, including those with assistantships and fellowships, will pay a nonrefundable university health services fee of $120 each year. This fee will provide Blue Cross-Blue Shield coverage and entitle the student to the medical care furnished by the University Health Service.

All financial obligations to the University must be discharged before graduation.

Refunds

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal form filed by the student. Nonattendance does not constitute official withdrawal. Questions regarding refunds should be discussed with the Bursar's Office.

Refunds will be granted in accordance with the following schedule:

	Amount of Refund
Official Withdrawal Filed Within:	Percentage of Tuition
First week of quarter	100
Second week of quarter	75
Third week of quarter	50
Fourth week of quarter	25

FINANCIAL AID

The Office of Financial Aid offers two types of Federal assistance to graduate students: the National Direct Student Loan and Work-Study. All awards are based on financial need. Aid granted from these programs sponsored by the Federal Government is dependent upon the amount of funds allocated to Northeastern University.

Northeastern University is a participant in the Graduate and Professional School Financial Aid Service (GAPSFAS). All applicants for financial aid must file a GAPSFAS form in order to be considered. This form may be obtained from the financial aid officer at the institution which the student now attends or from the Northeastern University Office of Financial Aid. All sections of the GAPSFAS form must be completed and sent to the Graduate and Professional School Financial Aid Service, Box 2614, Princeton, New Jersey 08540. No decision on an application for financial aid will be made until the GAPSFAS form is received.

Only students who have been officially accepted as degree candidates to a graduate school of Northeastern University may apply for financial aid. The University does not award financial assistance to students who are not citizens or permanent residents of the United States.

National Direct Student Loan

Under the National Direct Student Loan program, students may be allowed to borrow as much as $2,500 per academic year; however, the total

amount borrowed must not exceed $10,000 for the student's entire undergraduate and graduate program. Repayment and interest on these loans do not begin until nine months after the student ceases to carry at least a half-time academic load. The repayment of the principal may be extended over a ten-year period with an interest rate of 3% per annum.

College Work-Study Program

The College Work-Study Program is sponsored by the Federal Government. It is designed to give students an opportunity to earn as much as $3.50 per hour working in jobs on or off campus in public or private non-profit organizations. This program is administered solely by the Office of Financial Aid and is not to be confused with the University's cooperative education program.

Guaranteed Student Loan Program

A prime means of financial assistance is the Guaranteed Student Loan Program. Because of the easy availability of this loan relative to other types of financial assistance, it is recommended that all applicants for aid first seek assistance from this source. Students may receive guaranteed loans of up to $2500 per academic year from their local banks. Repayment of the principal and interest need not begin until nine months after the student ceases to carry at least a half-time academic load.

Martin Luther King, Jr., Scholarships

Established in 1969 in memory of the late Rev. Martin Luther King, Jr. Awards are made as openings occur to qualified minority graduate students who show financial need and are accepted to full-time study in the graduate schools of the University. Stipends will cover tuition and all fees.

Dr. Reubin J. Margolin Memorial Scholarship Fund

The Dr. Reubin J. Margolin Memorial Scholarship Fund was established in 1973 through the generosity of the family and friends of Dr. Reubin J. Margolin, an outstanding and dedicated individual and friend who, at the time of his death on April 6, 1972, was Chairman of the Department of Rehabilitation and Special Education at Northeastern University.

The income from the Dr. Reubin J. Margolin Memorial Scholarship Fund is awarded annually to a deserving student admitted to or enrolled in the College of Education or the Graduate School of Education and majoring in Rehabilitation and/or Special Education. Recipients must demonstrate financial need as well as the personal and professional qualities exemplified by Dr. Margolin.

The Office of Financial Aid does not award Graduate Assistantships or Fellowships. For further information regarding such assistance, students should contact their graduate school office.

Graduate Administrative Assistantships

Some University departments offer the graduate student an opportunity for remission of tuition and a stipend in return for half time spent in assisting with nonteaching, administrative duties. In all cases the student must register for a half-time academic load. It is assumed that applicants for such assistantships will be enrolled in a two-year program.

Tuition Assistantships

These appointments offer tuition waiver only. Graduate students given this type of appointment are assigned duties in the department requiring an average of 8 hours per week. They must register for a full-time academic load.

Teaching Assistantships

Graduate students given this type of appointment assist in the work of instructional departments or other offices of the University. The appointee may be assigned to class instruction, laboratory supervision, correcting papers and proctoring examinations. Including necessary preparation time, assigned duties require about 18 to 20 hours per week.

The student must register for a half-time academic load. It is assumed that applicants for such assistantships will be enrolled in a two-year program.

Traineeships

Graduate students given these appointments must devote full time to graduate work in accordance with the stipulation of the appointment. These appointments are made from traineeships available from NASA, NSF, NDEA, and other government grants to the University. They may be for 9 to 12 months.

Appointments

Appointments to fellowships and assistantships are ordinarily announced no later than April 15 for the following academic year or summer. Appointments are for a maximum of one year and are not automatically renewed. Students who hold assistantships are expected to devote full time to their studies and the duties of the award. They may not accept outside employment without the consent of their faculty adviser and the Director of the Graduate School.

Dormitory Proctorships

A number of proctorships in men's dormitories on or near the Huntington Avenue campus are available each year. Appointments carry a minimum compensation of room and board. Further information and application forms may be obtained from the Associate Dean of Students for Housing, 203 Ell Student Center.

faculty

Marvin Arffa, A.B., M.S., Ed.D., *Associate Professor of Education*
Joseph C. Aurelia, B.A., M.A., *Assistant Professor of Speech Pathology and Coordinator of Clinical Services*
Robert E. Bacheider, B.S.Ed., M.A.Ed., Ed.D., *Lecturer in Education*
Ronald E. Baptiste, A.B., Ed.M., Ed.D., *Associate Professor of Education*
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George W. Best, B.S., A.M., *Lecturer in Education*
Richard Brown, B.S., M.Ed., *Lecturer in Education*
Wendell R. Brown, B.A., LL.B., D.S.S., *Associate Professor of Education*
Nicholas J. Buffone, B.A., M.Ed., Ph.D., *Associate Professor of Education*
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Donald F. Crowe, B.S., M.Div., *Lecturer in Education*
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E. Lawrence Durham, A.B., M.A., *Professor of Education*
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Wilbert J. McClure, B.A., M.A., Ph.D., *Assistant Professor of Education*
JoAnne S. McKay, A.B., Ed.M., *Assistant Professor of Special Education*
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Joseph Meier, Ed.M., Ed.D., *Associate Professor of Education*
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Kathleen O'Rourke, M.Ed., *Lecturer in Education*
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William G. Quill, B.S., M.Ed., Ed.D., *Associate Professor of Education*
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Martin J. Wheeler, A.B., M.Ed., *Lecturer in Education*
James W. Wilson, B.S., M.A., Ph.D., *Research Professor, Cooperative Education*
Wesley G. Woll, B.S., M.D., *Lecturer in Education*
Alvin D. Zalinger, B.S., M.A., *Associate Professor of Education*

NORTHEASTERN UNIVERSI

programs of the graduate school of education

MASTER OF EDUCATION

Professional Specializations

School and College Counseling Programs
- Elementary School Counseling
- Secondary School Counseling
- Career Education Specialist
- College Counseling
- Student Personnel
- Cooperative Education Coordinator

Community and Rehabilitation Counseling Programs
- Community Mental Health Counseling
- Rehabilitation Counseling
- Community Services Counseling

Curriculum and Instruction
- English-Language Arts
- General Academic
- Reading
- Science-Mathematics
- Social Studies

Early Childhood Education
- Administration
- Teaching

Educational Administration
- Elementary and Secondary Administration
- Instructional Technology
- Occupational Education

Educational Research

Human Development

Rehabilitation Administration

Special Education
- Emotional Disturbance—Learning Disabilities
- Generic Special Educator
- Mental Retardation—Learning Disabilities
- Severely Handicapped
- Early Childhood Handicapped
- Special Education Community Personnel

Speech Pathology and Audiology
- Audiology
- Speech Pathology
- Teaching the Deaf

Nondegree Program for Certification of Elementary and Secondary Teachers

CERTIFICATE OF ADVANCED GRADUATE STUDY (CAGS)

Counselor Education
- Pupil Personnel Services Administration
- School Psychology
- Counseling
  - School
  - College
  - Community Mental Health
  - Rehabilitation

Educational Administration
- Cooperative Education
- Educational Administration
- Higher Education
- Instructional Technology

Rehabilitation and Special Education Administration

DOCTOR OF EDUCATION

Counselor Education
- Pupil Personnel Administration
- Student Personnel Administration

Educational Administration
- Administration of Cooperative Education
- Administration of Higher Education
- School Administration

Rehabilitation and Special Education
- Rehabilitation Administration
- Special Education Administration

MASTER OF EDUCATION DEGREE

Admission to Degree Candidacy

An applicant must have earned a bachelor's degree from an accredited institution and must complete all admissions procedures as described.

An applicant for graduate study in a master's degree program or a CAGS program should have all of the following material on file in the office of the Graduate School of Education three weeks (two months for full-time) prior to the beginning of classes in any given quarter. (Applicants for programs in Counselor Education and Special Education must have all material on file by April 15.)

1. Two completed application forms.
2. Two official transcripts from all colleges or universities attended.
3. References as follows:

a. If no teaching experience, three letters of recommendation from individuals acquainted with the applicant's scholastic, professional, or intellectual ability.
b. If teaching experience (beyond student teaching), one reference from the current or most recent supervisor.

4. An official copy of the Miller Analogies Test score (MAT).
5. Graduate Record Examination scores (aptitude test only) for applicants with 25% or more pass-fail grades.
6. For CAGS applicants, a record of an interview with the chairperson of the department to which they are applying.
7. For applicants whose native language is not English, an official copy of the results of the Test of English as a Foreign Language (TOEFL).

The Graduate School of Education may require a preadmission conference with any appliant. Applicants may at any time request a conference with the Director of the Graduate School of Education or his designate.

Application Fee

All applications for admission must be accompanied by an application fee (nonrefundable) of $15. No application will be processed until the fee has been received by the Graduate School of Education. Checks should be made payable to Northeastern University and sent to the Graduate School of Education, 102 The Fenway.

Confirmation

Applicants must confirm their acceptance to a program within the designated period of time. If confirmations are not received, places in the program will be offered to other applicants.

Students who have confirmed their acceptance to a program but who have not initiated their programs within four quarters of admission will be withdrawn from the Graduate School of Education.

Full-time Study

A full-time student must take three courses in all quarters except the summer session, during which he must take a minimum of two courses. Enrollment in an additional course in any quarter must be approved by the adviser.

Part-time Study

A part-time student may enroll in a maximum of two courses in any given quarter.

Program Selection and Registration

Upon acceptance as a degree candidate, the student will be assigned an adviser in his major area of study. After notification of acceptance by the

Graduate School of Education, the student must confer with the adviser regarding his program of studies and initial course registration. The student's initial program and any subsequent changes may develop only as a result of the written recommendation of the adviser.

Initial registration will be allowed only upon presentation of a "Permit to Register" card.

Special Student Status

Applicants who have earned a bachelor's degree from an accredited institution and who acknowledge that they do not wish to pursue a degree may be accepted as special students. Special students may register for a maximum of three courses, one per quarter, provided that they submit an application form, accompanied by an application fee of $15, and an official transcript, three weeks prior to the beginning of classes. Academic credit earned in such study may not be used to fulfill degree requirements in the Graduate School of Education unless the applicant is accepted as a degree candidate and the courses are applicable to his program. Special students may be considered for degree candidacy only upon full presentation of application materials and a formal petition to the Director of the Graduate School of Education.

Academic Classification

1. *Regular* Applicants who meet in full the criteria for immediate matriculation are classified as regular students.
2. *Provisional* Some applicants who do not meet regular admissions standards may be admitted as provisional students. Such students must maintain a B average in their first twelve quarter hours of work in order to continue in the graduate program. Provisional students admitted for part-time study may take only one course in their first quarter of study.
3. *Special* See above.

Programs of Study

The curricula of the programs for the Master of Education degree are given on pages 46-75.

Programs are available for students with or without regular teaching certification. Those with certification may major in the professional specializations listed on page 46.

Students without certification may pursue a Master of Education degree program for which certification is not mandatory (as indicated on page 46) or if able to devote full time to graduate study, may apply for a combined program as described on page 76.

A nondegree certification program for elementary and secondary teachers is available as described on page 75.

Comprehensive Examination

A comprehensive examination may be required by a department. Unsatisfactory performance in such an examination constitutes grounds for withholding the degree.

Academic Requirements

In order to qualify for the Master's Degree in Education, an average grade of B must be obtained in all courses. No additional course credits may be allowed in order to satisfy the B average required for the degree.

No student who receives a grade of less than B in three or more courses will be permitted to continue in the program. A student who has accumulated two grades of C from the same faculty member may not register for a third course with this faculty member.

A student who receives a grade of F in a course must make up the course in accordance with the recommendation of his adviser. A student who receives a grade of F in two courses will not be permitted to continue in the program.

Credit and Course Requirements

In satisfying the requirement for a minimum of 40 quarter hours, a student's program must include at least 12 courses which apply to the degree.

Transfer Credits

A maximum of 12 quarter hours of credit obtained at another institution may be accepted toward the master's degree provided that the credits are recommended for transfer by the student's adviser, consist of work taken at the graduate level for graduate credit, carry grades of A or B, have been earned at an accredited institution, and have not been used toward any other degree. Students should petition the Director of the Graduate School in writing for all transfer credit by completing the necessary form, obtainable from either the office of the Graduate School of Education or the faculty adviser. The completed form must be submitted to the Director of the Graduate School of Education along with an official transcript and an excerpt from the catalog describing the course.

No transfer form will be considered complete without the signature of the student's adviser or department chairperson. Grades on transfer credits may not be used for the purpose of obtaining the academic average necessary for completion of the degree requirements.

Time Limitations

Course credits earned in the program of graduate study, or accepted by transfer, are valid for a maximum of seven years.

NONDEGREE PROGRAM FOR CERTIFICATION OF ELEMENTARY AND SECONDARY TEACHERS

Admission

Applicants for this program must follow the admissions procedures as described on page 38 and meet the admissions requirements for the Master of Education degree. In addition, applicants whose backgrounds may not include an approved course in such areas as human development or learning must take such a course either before they enter the program or before student teaching. Candidates for secondary certification must have completed, before admission, at least 36 quarter hours of courses in the field in which they are preparing to teach, with a QPA for all courses taken in that field of at least 2.000.

Academic Requirements

In order to qualify for Student Teaching, students must have completed the four required courses with a B average, and be recommended by their major adviser.

A student may repeat a course in which he has received a grade of C or F, and the second grade will govern. However, only one course may be repeated on this basis.

CERTIFICATE OF ADVANCED GRADUATE STUDY (CAGS) PROGRAM

Admission

An applicant for the Certificate of Advanced Graduate Study in Counselor Education, Educational Administration, and Rehabilitation and Special Education must hold a master's degree from an accredited institution and file supportive materials in accordance with guidelines which will be provided upon request. Inquiry, specifying the program for which information is sought, should be addressed to the Director of the Graduate School of Education.

Applicants for CAGS programs must have application materials on file in the office of the Graduate School of Education three weeks (two months for full-time) prior to the beginning of classes in any given quarter.

Academic Requirements

In order to qualify for the Certificate of Advanced Graduate Study, an average grade of B must be obtained in all courses. No additional course credits may be allowed in order to satisfy the B average required for the certificate.

No student who receives a grade of less than B in three or more courses will be permitted to continue in the program. A student who has accumulated two grades of C from the same faculty member may not register

for a third course with this faculty member.

A student who receives a grade of F in a course must make up the course in accordance with the recommendation of his adviser. A student who receives a grade of F in two courses will not be permitted to continue in the program.

Transfer Credits

See requirements under master's degree on preceding pages.

Time Limitations

Course credits earned in the program of graduate study, or accepted by transfer, are valid for a maximum of seven years.

Qualifying and Comprehensive Examinations

Students may be required to take a qualifying examination. All students are required to satisfactorily complete a comprehensive examination in order to qualify for the Certificate of Advanced Graduate Study.

DOCTOR OF EDUCATION DEGREE

Admission

Applicants for admission to the Doctor of Education degree program must file evidence of a master's degree or its equivalent from an accredited institution and such other materials as required by the Graduate School of Education. Materials will be accepted from applicants who are currently enrolled in graduate studies and who expect to obtain the master's degree within two terms of the time of application.

Students who have graduated from or are currently enrolled as regular CAGS students in the Graduate School of Education may apply for the doctoral degree program. Although most CAGS course work is applicable, there are different admissions criteria and formal application must be made. Conversely, regular doctoral students who either choose not to complete the doctoral program or are disqualified from continuing, may make formal application to transfer to the CAGS program.

As part of the application procedure, the applicant must declare a major field of specialization, submit a written statement of purpose for pursuing doctoral study, and if requested, meet with an admissions committee for further evaluation. Applications to the Doctor of Education degree program will be acted upon twice yearly, for September or March (Fall or Spring Quarter matriculation). Application materials must be completed at least a quarter prior to the time the student is seeking admission or the candidate's application will automatically be forwarded for inclusion in the next action period. Within this period candidates will be informed of their admission status as soon as possible.

Classification and Degree Candidacy

Students taking advanced graduate work are classified as follows:

1. Doctoral Student
   Students in this classification have been accepted for doctoral study, but have not yet passed the qualifying examination.
2. Doctoral Degree Candidates
   Students in this classification have completed forty-eight quarter hours of graduate work and have passed the qualifying examination.

Academic Requirements

In order to qualify for the Doctor of Education degree, an average grade of B must be obtained in all courses. No additional course credits will be allowed in order to satisfy the B average for the degree. No student who receives a grade of less than B in three or more courses will be permitted to continue in the program. A student who has accumulated two grades of C from the same faculty member may not register for a third course with this faculty member. A student who receives a grade of F in a course must make up this course in accordance with the recommendation of the adviser. A student who receives a grade of F in two courses will not be permitted to continue in the program.

Qualifying Examination

A qualifying examination must be taken by each doctoral student seeking degree candidacy. The purpose of the examination is to evaluate the student's general understanding of the field of specialization. The qualifying examination must be taken before the completion of forty-eight quarter hours of doctoral study.

Comprehensive Examination

After completion of all formal course work, the doctoral degree candidate must satisfactorily demonstrate, by means of a comprehensive examination, breadth and depth of knowledge in the area of specialization, as well as general professional understanding and comprehension of major issues in related fields.

Dissertation

As part of the degree program, each candidate must complete a dissertation which embodies the results of extended, creative, independent research and proper evaluation and interpretation of the results. A Dissertation Committee, made up of a major adviser and at least two other faculty members, must approve the dissertation.

Final Oral Examination

The final oral examination will be taken after completion of all other requirements for the doctoral degree. The examination will be held at least three weeks before the Commencement at which the degree is to be awarded and the results of the examination will be made available immediately to the student.

The substance of the final oral examination will include the subject matter of the doctoral dissertation and significant developments in the area of the student's specialization.

Transfer Credit

In satisfying the course requirements beyond those required for the master's degree, the adviser may recommend to the Committee of the Graduate School of Education transfer credit up to a maximum of twenty-five percent of such course requirements.

Time Limitation

After admission to degree candidacy, a maximum of five years will be allowed for completion of the degree requirements. Any extension of this time must be approved by the Committee of the Graduate School of Education.

Financial Aid

A limited amount of financial aid is available. Inquiries regarding this matter should accompany application.

fields of study

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All students must complete one of the programs as outlined below. In most cases, the sequence is designed to be very flexible. Any variations or changes must have the prior recommendation of the major adviser and approval of the Director of the Graduate School of Education.

*Teaching certification not mandatory.

MASTER OF EDUCATION
CORE REQUIREMENT

Required of all candidates:

Area I — Research

50.815 Research Design in Education
Entrance into this course must be preceded by satisfactory completion of a proficiency examination in statistics administered by the Center for Programmed Instruction or by satisfactory completion of 50.841 Introduction to Educational Statistics. *Important:* 50.815 must be included among the first six courses taken by each student. (See further information under the 50.815 course description.)

All candidates must complete at least one course in each of two of the following areas:

Area II — Psychological Foundations

50.803 Child Psychology
50.804 Adolescent Psychology
These two courses are intended for students with no previous background in psychology.
50.806 Psychology of Learning
50.810 Psychology of Personality
50.811 Psychology of Thinking
It is strongly recommended that entrance into any of these courses be preceded by a course in psychology.
50.808 Seminar in Child Development
Entrance into this course *must* be preceded by a course in child psychology or human development.
50.809 Seminar in Adolescent Development
Entrance into this course *must* be preceded by a course in adolescent psychology or human development.
50.850 Communications Theory

Area III — Social Foundations

50.801 Educational Anthropology
50.802 Sociology of Education
These two courses are intended for students with no previous background in sociology and anthropology.
50.805 Personality and Social Structure
It is strongly recommended that entrance into this course be preceded by a course in sociology, cultural anthropology, or social psychology.
50.820 Seminar in Contemporary Issues in American Education

Area IV — Humanistic Foundations

50.812 History of Education
50.818 Comparative Education
50.822 Topics in the Philosophy of Education

PROGRAMS

Counselor Education

General Information

The Department of Counselor Education offers several concentrations within two major program clusters: School and College Counseling and Community and Rehabilitation Counseling. Each of the concentrations in these clusters is described on the following pages. Prospective students should apply to one of the two clusters.

The master's degree requirements may be completed by full-time students in four quarters or one calendar year. However, the Department considers these programs to be minimal and urges most students to take an additional year of study leading to the CAGS.

The practicum sequence (53.805-53.806) including the concurrently required counseling course (53.804) is offered only on a sequential basis beginning in the fall quarter. Part-time students may not begin this sequence until their second year of study. They must apply for practicum placement by April 1 of the spring preceding practicum placement.

Full-time students (eligible for practicum) will be asked to complete a practicum application either at the time of their group interview or immediately upon acceptance. In general, students should expect to spend two days (or twelve hours) weekly at their practicum sites between October 1 and June 15. Placements are made by matching student interests and experience with practicum site availability. Field site supervisors have the option of accepting or rejecting recommended students for placement in their setting. Arrangements for practicum site placement will be completed, in general, by August 1.

Some students, with special permission, may be able to use their place of employment as a practicum site provided arrangements for supplementary experience are made with their advisers.

Candidates for admission to summer and fall quarters must complete application materials no later than the preceding April 15. After the application materials are submitted, applicants will be notified by mail of dates for small group interviews with other candidates and college staff. Acceptance decisions for both part-time and full-time applicants will be mailed between April 1 and May 31.

Internships — Financial Aid

No financial aid in the form of scholarships or grants is available to students through the Department. Students should consult the Financial Aid Office of the University for information as to what is available to graduate students. However, the Department does try to develop paid Internships in various work settings as both a means to ease the financial burden and to provide a more extensive work experience. The numbers of internships are limited, and they are not necessarily available in all

programs. Their availability is entirely dependent on the interest and ability of schools or agencies to make money available for an internship position.

The opportunity for professional development makes the Internship especially attractive, and any interested student is encouraged to apply. No placements can be guaranteed, however. Applications for internships and additional information are available from the Department of Counselor Education or from the Graduate School Admissions Office.

Core Curriculum Requirements

In addition to three Foundations of Education core requirements described on page 47, all program choices in the Department have a common core of required courses as follows:

53.800 Philosophical Foundations of Guidance and Human Services
53.801 Tests and Test Procedures
53.804 Counseling Theory and Process
53.805-53.806 Counseling Practicum

One of the following:

53.813 School Counseling Strategies
53.814 Vocational Counseling Strategies
53.815 Rehabilitation Counseling Strategies
53.816 Psychological Counseling Strategies

The Counseling Practicum is always specific to the particular concentration to which the student has been admitted. These core requirements constitute nine of the twelve courses required for the master's degree. The remaining three courses will be selected in consultation with the adviser. These course selections must be approved by the adviser prior to registration.

School and College Counseling Programs

Program concentrations in this cluster include preparation for positions in elementary school counseling, secondary school counseling, career education, college counseling, student personnel, and cooperative education.

Elementary Counseling Program

The Elementary School Counseling Program prepares students to: 1) help children to grow in self-understanding and in positive fuller use of potential; 2) help parents to understand the developmental needs of all pupils and work with parents to meet the individual needs of their own children in the school situation; 3) participate in creating a school environment conducive to learning and growth for all children; and 4) participate in curriculum development and change. The training focuses on developing competencies in individual counseling, group counseling, consulting,

testing, and parent counseling. Students are prepared to work with children, parents, and teachers in schools and related settings.

Elementary Counseling Practicum placements are made in a variety of urban and suburban elementary schools and in child guidance clinics.

Sample Program for Elementary Counseling Program:

Departmental Requirements
- 53.800 Philosophical Foundations of Guidance & Human Services
- 53.801 Tests and Test Procedures
- 53.804 Counseling Theory and Process
- 53.805-53.806 (01) Practicum in Elementary Counseling I, II

Specialized Courses
- 53.810 Elementary School Guidance
- 53.813 School Counseling Strategies
- 53.824 Individual Intelligence Testing

Required Foundations Core Course
- Area I 50.815 Research Design in Education

Recommended Foundations Core Courses
- Area II 50.806 Psychology of Learning or
- 50.810 Psychology of Personality or
- 50.808 Seminar in Child Development
- 50.807 Abnormal Psychology
- Area III 50.802 Sociology of Education or
- 50.805 Personality and Social Structure or
- 50.820 Seminar in Contemporary Issues in American Education

Electives (Choose one)
- 53.808 Group Counseling or
- 53.811 Family and Parent Counseling or
- 56.807 Learning Disabilities

Secondary Counseling Program

The Secondary School Counseling Program assumes that there are things which the school counselor can do to make the school a better place in which to learn and to teach. Various ways in which the guidance person can work with pupils, parents, teachers, administrators, and community agencies as a counselor, as a consultant, and as a coordinator are emphasized. The focus of the program is on the practical background knowledge and the specific skills the counselor needs for helping students to learn more effectively, to make decisions more maturely, and to achieve personal fulfillment more completely.

Secondary Counseling practicum placements are made in a variety of urban and suburban secondary schools and school outreach programs.

Sample Program for Secondary Counseling Program:

Departmental Requirements
- 53.800 Philosophical Foundations of Guidance & Human Services
- 53.801 Tests and Test Procedures
- 53.804 Counseling Theory and Process
- 53.805-53.806 (02) Practicum in Secondary Counseling I, II

Specialized Courses
- 53.802 Vocational Development and Occupational Information
- 53.813 School Counseling Strategies

Required Foundations Core Courses
- Area I 50.815 Research Design in Education

Recommended Foundations Core Courses
- Area II 50.806 Psychology of Learning or
- 50.810 Psychology of Personality or
- 50.809 Seminar in Adolescent Development
- 50.807 Abnormal Psychology
- Area III 50.802 Sociology of Education or
- 50.805 Personality and Social Structure or
- 50.820 Seminar in Contemporary Issues in American Education

Electives (Choose two)
- 53.808 Group Counseling
- 53.811 Family and Parent Counseling
- 53.814 Vocational Counseling Strategies
- 56.807 Learning Disabilities

Career Education Program

The Career Education Program is designed to prepare students for a variety of counselor-type roles within the career education orientation. These newly emerging roles within the broad field of career education encompass three specific dimensions of training: 1) the organization and utilization of career information as a resource; 2) the development of job placement—job counseling skills; and 3) the innovation of appropriate curriculum practices and revisions. The program is designed so that at the practicum phase of their training students can be placed in field settings where they can obtain actual experience in all three of these dimensions of career education. This program is intended for students who have experience and/or an interest in working with school-age youth — grades kindergarten to twelve — in the area of career development and work placement.

Career Education Specialist Practicum placements are made in both comprehensive and vocational-technical schools where there is an emphasis on career education and/or work-study type programs.

Sample Program for Career Education Specialist:

Departmental Requirements
- 53.800 Philosophical Foundations of Guidance & Human Services
- 53.801 Tests and Test Procedures
- 53.804 Counseling Theory and Process
- 53.805-53.806 (03) Career Education Practicum I, II

Specialized Courses
- 53.802 Vocational Development and Occupational Information
- 53.814 Vocational Counseling Strategies
- 52.816 Seminar in Career Education

Required Foundations Core Course
- Area I 50.815 Research Design in Education

Recommended Foundations Core Courses
- Area II 50.806 Psychology of Learning or
  50.810 Psychology of Personality or
  50.809 Seminar in Adolescent Development
- Area III 50.802 Sociology of Education or
  50.805 Personality and Social Structure or
  50.820 Seminar in Contemporary Issues in American Education

Electives (Choose one)
- 53.807 Administration of Guidance Services
- 53.808 Group Counseling
- 53.813 School Counseling Strategies

College Counseling and Student Personnel Services Program

Preparation for both college counseling and student personnel positions is similar and based on the assumption that the student personnel worker must have the human relations skills of the counselor, and the counselor must have an understanding of both the learning development needs of students and the instructional environment of the college setting. Graduates will have a basic knowledge of vocational development and career planning, information-gathering, interviewing techniques, decision-making strategies, and group process. Students may then choose to emphasize the counseling role in the counseling center or the student personnel role, which is more programmatic, within the institution. Practicum placements can be varied to suit individual interests. Positions for graduates may include counseling in junior colleges or residence halls; counseling in financial aid, student activities, or admissions offices; or that of assistant to a dean of students.

College Counseling and Student Personnel Practicum placements are made in a variety of junior college, college, and university settings in the Greater Boston area. In addition to counseling center placements, there are

placements in residence halls, financial aid offices, and other student personnel program offices. Placements are also made in such higher education related settings as the Center for Alternative Education, a personal development program.

Sample Program for College Counseling Program:

Departmental Requirement
- 53.800 Philosophical Foundations of Guidance & Human Services
- 53.801 Tests and Test Procedures
- 53.804 Counseling Theory & Process
- 53.805-53.806 (04) College Counseling Practicum I, II

Specialized Courses
- 53.809 The College Student and The Campus
- 53.814 Vocational Counseling Strategies or
- 53.816 Psychological Counseling Strategies

Required Foundations Core Course
- Area I 50.815 Research Design in Education

Recommended Foundations Core Courses
- Area II 50.810 Psychology of Personality or
- 50.809 Seminar in Adolescent Development
- 50.807 Abnormal Psychology
- Area III 50.805 Personality and Social Structure or
- 50.820 Seminar in Contemporary Issues in American Education

Electives (Choose three)
- 53.814 Vocational Counseling Strategies or
- 53.816 Psychological Counseling Strategies
- 53.808 Group Counseling
- 53.802 Vocational Development and Occupational Information
- 53.811 Family and Parent Counseling

Sample Program for Student Personnel Services Program:

Departmental Requirements
- 53.800 Philosophical Foundations of Guidance & Human Services
- 53.801 Tests and Test Procedures
- 53.804 Counseling Theory & Process
- 53.805-53.806 (05) Student Personnel Practicum I, II

Specialized Courses
- 53.809 The College Student and The Campus
- 53.814 Vocational Counseling Strategies
- 53.812 Seminar in Student Personnel Work

Required Foundations Core Course

Area I	50.815	Research Design in Education

Recommended Foundations Core Courses

Area II	50.810	Psychology of Personality or
	50.809	Seminar in Adolescent Development
	50.807	Abnormal Psychology
Area III	50.805	Personality and Social Structure or
	50.820	Seminar in Contemporary Issues in American Education

Electives (Choose one)

52.864	Typologies of Higher Education
52.868	The Community College

Cooperative Education Program

The rapid expansion of cooperative education programs in higher education throughout the United States has increased the need for trained persons to staff the centers that coordinate and operate these programs. Northeastern University is the largest cooperative education institution in the world, and as such, can provide an excellent opportunity for the student interested in this aspect of higher education. At the master's level the preparation emphasizes a counseling base because the coordinator's prime role involves student contact. The three major elements in the coordinator's role are 1) vocational decision-making counseling; 2) work placement and work evaluation; and 3) curriculum development within the institution. The coordination function involves providing links between the student and his educational program, and the employer and his work setting. These two elements are combined to produce a total educational experience for the student. Preparation beyond the master's degree can lead to careers in student personnel, counseling, higher education administration, or cooperative education administration.

Cooperative Education Coordinator placements will be made in the Division of Cooperative Education, Northeastern University, and in other colleges and junior colleges in the area that have or are developing cooperative education programs.

Sample Program for Cooperative Education Specialist:

Departmental Requirements

53.800	Philosophical Foundations of Guidance & Human Services
53.801	Tests and Test Procedures
53.804	Counseling Theory & Process
53.805-53.806 (06)	Cooperative Education Practicum I, II

Specialized Courses
- 53.802 Vocational Development and Occupational Information
- 53.809 The College Student and The Campus
- 53.814 Vocational Counseling Strategies
- 52.824 Administration of Cooperative Education

Required Foundations Core Course
- Area I 50.815 Research Design in Education

Recommended Foundations Core Courses
- Area II 50.806 Psychology of Learning or
  50.809 Seminar in Adolescent Development or
  50.810 Psychology of Personality
- Area III 50.802 Sociology of Education or
  50.805 Personality and Social Structure or
  50.820 Seminar in Contemporary Issues in American Education

Electives (Choose one)
- 53.808 Group Counseling
- 53.816 Psychological Counseling Strategies

Community Mental Health, Community Services, Rehabilitation Counseling Programs

This cluster provides applied training in three programmatic areas of study: Community Services Counseling (preventive mental health), Rehabilitation Counseling and Community Mental Health Counseling. These programs emphasize three aspects of professional development: field-based training, didactic learning and personal growth. Field-based training is accomplished through extensive practicum work in clinics and agencies in the metropolitan Boston area; didactic learning occurs in graduate courses and practicum supervision on campus and in the field. Personal growth is encouraged through consultation with program advisers, field supervisors and in group counseling courses.

Community Services Program

The Community Services counseling program is designed to prepare students to work in a variety of human services agencies providing preventive mental health, informational, supportive and recreational services for broad segments of the population regarded as behaving normally. Much of the work could be categorised as preventive community health. Graduates will have a basic knowledge of vocational development and career planning, information-gathering, interviewing techniques and decision-making strategies. They will have a knowledge of psychometrics, adolescent and adult personality development, procedures in educational and vocational placement and the utilization of multiple helping agencies in meeting clients' needs. They will have skills in individual and small group counseling and decision-making procedures.

Community Services Counseling practicum placements will include state offices of the Division of Employment Security, Manpower Training Programs, Model Cities Programs, YMCA, YWCA, Boys' Clubs, Girls' Clubs, recreational facilities, community centers, drop-in centers, Youth Activities Commission, and career planning agencies.

Sample Program for Community Services Counseling Program:

Departmental Requirements:

53.800 Philosophical Foundations of Guidance & Human Services
53.801 Tests and Test Procedures
53.804 Counseling Theory and Process
53.805-53.806 (07) Community Services Practicum I, II

Specialized Courses:

53.814 Vocational Counseling Strategies
53.808 Group Counseling

Required Foundations Core Course:

Area I 50.815 Research Design in Education

Recommended Foundations Core Courses

Area II 50.810 Psychology of Personality or
50.809 Seminar in Adolescent Development or
50.807 Abnormal Psychology
Area III 50.805 Personality and Social Structure

Electives (Choose two):

53.802 Vocational Development and Occupational Information
52.816 Seminar in Career Education
53.816 Psychological Counseling Strategies
56.956 Community Planning in Rehabilitation

Rehabilitation Counseling Program

The Rehabilitation Counseling program is designed to prepare students to deliver comprehensive services to disabled and handicapped populations with the ultimate objective of improving the nature of their social, family, and personal functioning. The population to be served includes the physically handicapped, mentally ill, mentally retarded, alcohol and drug addicted, chronically dependent, and penal offenders. Graduates of this program will be generally familiar with the nature of physical, mental, and social handicaps; with the existing rehabilitative services through work experiences, field visits, reading and discussions with agency personnel; with the elements of rehabilitation operations, including systematic evaluation, individual counseling, planning for additional needed examinations and services, planning for training, vocational planning and placement, and follow-up services in the community.

Rehabilitation counseling practicum placements are made in community workshops for the physically handicapped, mentally ill, mentally retarded; workshops and half-way houses for drug addicts, alcoholics, and penal offenders; rehabilitation centers in mental hospitals, schools for mentally retarded and correctional institutions; rehabilitation programs for dependent persons in the welfare department and in the Massachusetts Rehabilitation Commission.

Sample Program for Rehabilitation Counseling Program:

Departmental Requirements
- 53.800 Philosophical Foundations of Guidance & Human Services
- 53.801 Tests and Test Procedures
- 53.804 Counseling Theory and Process
- 53.805-53.806 (08) Rehabilitation Counseling Practicum I, II

Specialized Courses
- 53.815 Rehabilitation Counseling Strategies
- 56.950 Introduction to Rehabilitation
- 56.951 Medical Rehabilitation

Required Foundations Course
- 50.815 Research Design in Education

Recommended Foundations Core Courses
- Area II 50.810 Psychology of Personality or
  50.807 Abnormal Psychology
- Area III 50.805 Personality and Social Structure

Electives (Choose one)
- 53.808 Group Counseling
- 53.811 Family and Parent Counseling
- 56.983 Rehabilitation of the Alcoholic and Drug Dependent
- 56.984 Rehabilitation of the Penal Offender

Community Mental Health Counseling

The Community Mental Health Counseling program is designed to prepare students to assist in the delivery of comprehensive mental health services to individuals, families and groups experiencing personal, developmental and social problems. Graduates will be introduced to the major approaches to individual, group, marriage and family counseling. They will have some knowledge of important environmental effects on the behavior of various client populations. Because of the comprehensive nature of the community mental health field, students seeking admission to this program should give serious consideration to a two-year commitment or its equivalent leading to the completion of both a M.Ed. degree and a Certificate of Advanced Graduate Study.

Community Mental Health Counseling practicum placements are made in out-patient clinics, in-patient facilities, community mental health centers, city hospitals having family counseling services, state mental hospitals, drop-in centers, career planning agencies, adolescent counseling programs, street-work and out-reach counseling programs.

Sample Program for Community Mental Health Counseling Program:

Departmental Requirements
- 53.800 Philosophical Foundations of Guidance & Human Services
- 53.801 Tests and Test Procedures
- 53.804 Counseling Theory and Process
- 53.805-53.806 (09) Community Mental Health Practicum I, II

Specialized Courses
- 53.816 Psychological Counseling Strategies
- 53.808 Group Counseling
- 53.811 Family & Parent Counseling
- 53.831 Advanced Group Counseling

Required Foundations Core Course
- Area I 50.815 Research Design in Education

Recommended Foundations Core Courses
- Area II 50.807 Abnormal Psychology or
- 50.808 Seminar in Child Development or
- 50.809 Seminar in Adolescent Development
- Area III 50.805 Personality and Social Structure

Electives (Choose one)
- 56.956 Community Planning in Rehabilitation
- 53.818 Case Studies in Marriage and Family Counseling
- 53.830 Seminar in Contemporary Issues in Counseling

Curriculum and Instruction (Including Programs in Reading)

The programs in Curriculum and Instruction are appropriate for certified or experienced teachers who wish to prepare for instructional leadership and curriculum development responsibilities, who wish to expand their professional backgrounds in subject matter or pedagogy, or who wish to achieve reading certification.

This program will enable its graduates:

(1) to view the educational process as an ongoing activity embodying both continuity in each of its parts and inter-relatedness among its parts;

(2) to plan and institute learning activities which promote continuity and inter-relatedness;

(3) to evaluate and modify appropriately existing programs and practices in their special fields;

(4) to identify educational needs, analyze them, and develop suitable plans to meet them;
(5) to institute desired changes in educational practice.

The following roles are some of those for which graduates of the program will be prepared:

(1) specialist in a particular content area, such as reading, mathematics, science, social studies, English-language arts, at one or more levels — elementary, secondary, or adult education;
(2) curriculum specialist in a variety of educational settings;
(3) instructional specialist such as team leader, conductor of workshops, master teacher, and so forth, in a school or other educational setting.

The Master of Education in Curriculum and Instruction is divided into four basic areas of study:

1. Master of Education Core
2. Curriculum and Instruction Core
   The Curriculum and Instruction Core consists of two sequential courses which individually and together emphasize a unitary view of the processes of curriculum development and instructional practices at all levels of education and in all school subjects. The Curriculum and Instruction Core is taught jointly by members of the Department, and students have the unique opportunity of studying with a wide range of faculty, each contributing his individual expertise and perspective within the context of the common purpose.
3. Specialization
   A specialization consists of a number of courses constructed around a broad area through which students can pursue their specific interests while at the same time keeping sight of larger contexts. The courses are taught jointly by members of the Department of Curriculum and Instruction, grouped according to the commonalities among their subjects, thus giving students the opportunity to work within a context which, while recognizing the discreteness of a subject, at the same time encourages recognition of what this subject shares with its fellows in its area.

   Students will normally select one area of specialization from those listed below, depending upon their background and interests. Students whose interests lie outside the above areas will be permitted to design, with their advisers, a program to meet their needs. Students seeking reading certification will fulfill the state requirements by completing the courses in the Reading specialization.
4. Electives
   The elective portion of the Curriculum and Instruction Program will enable students to pursue other areas of interest which will complement or extend their area of specialization. Electives can be selected broadly from the offerings of the Graduate Schools of the University.

Specimen Programs

Master of Education Core
Three courses as defined on page 47.
Curriculum and Instruction Core*
51.880 Evolution and Revolution in the School Curriculum
51.881 The Dynamics of Innovation in Curriculum and Instruction (51.881 is not a required course for students specializing in Reading.)
*Students who have completed 51.801 may be excused from 51.880 or 51.881 with the approval of the adviser.

Specializations
Science-Mathematics
51.837 Curriculum Problems in Science and Mathematics
51.838 Seminar in Science and Mathematics Teaching
51.839 Implementing Change in Science and Mathematics Education
Electives (four to be approved by adviser)

or

Social Studies
51.851 Seminar in Current Issues in the Social Studies
51.853 History and the Social Sciences in the School Curriculum
51.854 Social Science Materials Seminar
Electives (four to be approved by adviser)

or

English-Language Arts
51.870 Developmental Reading and Writing
51.871 Reading and Language Disabilities I
51.872 Literature and Materials Seminar
Electives (four to be approved by adviser)

or

Reading
51.870 Developmental Reading and Writing
51.871 Reading and Language Disabilities I
51.872 Literature and Materials Seminar
51.873 Reading Clinic I
51.874 Reading and Language Disabilities II
51.875 Reading Clinic II
Electives (two to be approved by adviser)

or

General Academic
51.870 Developmental Reading and Writing
51.871 Reading and Language Disabilities I
51.837 Curriculum Problems in Science and Mathematics Education

51.838 Seminar in Science and Mathematics Teaching
51.853 History and the Social Sciences in the School Curriculum
51.854 Social Science Materials Seminar
Elective (one to be approved by adviser)

or

Combined Reading Certification

A special program offering the Liberal Arts or non-Education graduate the opportunity to earn the Master of Education degree plus teacher certification (elementary or secondary) and certification as a reading specialist (K-12). This program is for full-time students only and will take a minimum of five full-time quarters to complete. Students will be accepted to begin in the Summer or Fall quarters. (See page 75 for description of the teacher certification part of this program.)

or

Other Purposes

A student who wishes to specialize in curriculum and instruction in a field not included in those listed above should make an appointment with an adviser for this program who will help him develop an appropriate course of study by drawing on courses offered throughout the Graduate Schools of the University.

Each candidate's program must be approved by his faculty adviser before he begins his course of study. A student admitted to special student status who feels he may eventually wish to be admitted to degree candidacy must consult with an appropriate faculty adviser before he enrolls in any course.

Early Childhood Education

In the field of Early Childhood Education two distinct programs are provided at the master's degree level. The programs are in the areas of Administration of Early Childhood Education and Teaching in Early Childhood Education.

Administration of Early Childhood Education

This program is designed to prepare the student for entry into the field of Administration of Early Childhood Education, to assume such positions as administrator or director of day care centers, nursery schools, kindergartens, and similar organizations. Students completing the program will be expected to display effective administrative behavior related to Early Childhood Education based upon knowledge of children, learning, and the administrative process. A typical program is as follows:

Master of Education Core (required of all candidates)

50.815 Research Design in Education
50.808 Seminar in Child Development
One additional course from Area III (Social Foundations) or Area IV (Humanistic Foundations)

Educational Administration Requirements
- 52.810 Leadership in Education: Part I
- 52.811 Leadership in Education: Part II
- 52.813 Instructional Leadership: Curriculum Development and Supervision
- 52.826 Administration of the Elementary School
- 52.843 Administrative Internship
- 52.828 Administration of Early Childhood Education
- 53.811 Family and Parent Counseling
  or
- 56.835 Socio- and Psychodynamics of Family Life

Electives

Two courses chosen in consultation with an adviser

Teaching in Early Childhood Education

This program is designed to prepare certified elementary teachers for an instructional or related role in the field of Early Childhood Education such as teacher, coordinator, or supervisor in day care centers, nursery schools, kindergartens, and similar organizations. Students completing the program will be expected to display effective instructional behavior related to Early Childhood Education based upon knowledge of children, teaching and learning. A typical program is as follows:

Master of Education Core (required of all candidates)
- 50.815 Research Design in Education
- 50.808 Seminar in Child Development

One additional course from Area III (Social Foundations) or Area IV (Humanistic Foundations)

Early Childhood Program Requirements
- 51.880 Evolution and Revolution in the School Curriculum
- 51.881 Dynamics of Curriculum Design
- 56.848 Early Childhood Learning Problems—Identification and Program Development
- 93.801 Seminar in Early Childhood Education Theory and Practice
- 93.802 Practicum in Early Childhood Education I
- 93.803 Practicum in Early Childhood Education II
- 53.811 Family and Parent Counseling
  or
- 56.835 Socio- and Psychodynamics of Family Life

Elective

One course chosen in consultation with an adviser

For course descriptions see appropriate departmental offerings as well as inter-departmental courses.

Educational Administration

In the field of educational administration, three distinct programs are provided at the master's degree level. These programs are in the areas of

elementary and secondary school administration, instructional technology, and occupational education.

Elementary and Secondary Administration

This program is designed to prepare the student for initial entry into the field of educational administration, preparing him for such beginning positions as assistant principal, principal of a small school, department chairman, special program director, or beginning administrator in allied fields, as well as to serve as a foundation for further graduate study. A typical program is as follows:

Master of Education Core (required of all candidates)
Three courses as defined on page 47.
Educational Administration Requirements
52.810 Leadership in Education: Part I
52.811 Leadership in Education: Part II
Departmental Program of Study
52.813 Instructional Leadership: Curriculum Development and Supervision
52.805 Simulated Problems: Secondary School Administration
and/or
52.814 Simulated Problems: Elementary School Administration
52.806 Directed Field Experiences in the Administration of the Elementary School
52.807 Directed Field Experiences in the Administration of the Secondary School
52.808 Seminar in Educational Administration
52.826 Administration of the Elementary School
and/or
52.827 Administration of the Secondary School
Electives (to be approved by adviser)

Upon completion of the above program, a comprehensive examination is given to each student.

Instructional Technology

In recent years considerable growth and expansion has taken place in the area of technology for instructional purposes. With this thought in mind, the master's degree in this field has been created. It is aimed at formally preparing students to serve effectively as directors of such programs in schools, colleges, government, and industrial settings. This program does not automatically lead to certification as an Audiovisual Media Specialist; those seeking such certification should consult their program adviser.

A typical program:

Master of Education Core (required of all candidates)
Three courses as defined on page 47.
Educational Administration Required Courses (3)
52.810 Leadership in Education: Part I

52.811 Leadership in Education: Part II
52.813 Instructional Leadership: Curriculum Development and Supervision

Instructional Technology Required Courses (5)
52.822 Foundations of Instructional Communications and Technology
52.823 Principles of Instructional Systems Development
52.817 Design, Production, and Utilization of Instructional Materials.
52.818 Developing Curriculum Learning Packages
52.821 Administration of Instructional Media Programs

Upon completion of the above program, a comprehensive examination is given to each student.

Occupational Education

This program of study is designed to equip prospective administrators and supervisors of occupational and career education with understandings, skills, and technical competencies which will enable them to assume and perform leadership functions in such positions as coordinators, supervisors, or district-wide directors in elementary schools, regular or comprehensive secondary schools, specialized vocational schools, community colleges, or at the state level. Satisfactory completion of an oral conference and a written comprehensive examination is also a requirement of this program.

Master of Education Core (required of all candidates)
Three courses as outlined on page 47.

Educational Administration Requirements (4)
52.810 Leadership in Education Part I
52.811 Leadership in Education Part II
52.813 Instructional Leadership: Curriculum Development and Supervision
52.826 Administration of the Elementary School
or
52.827 Administration of the Secondary School

Departmental Program of Studies in Occupational Education (5)
52.806 Directed Field Experiences in the Administration of the Elementary School
52.807 Directed Field Experiences in the Administration of the Secondary School
52.815 Simulated Problems: Administration of Occupational Education
52.816 Seminar in Career Education
52.843 Internship—other appropriate occupational electives from the Graduate School of Education.

Educational Research

This program is designed to train educational researchers who will have: 1) an understanding of the nature and characteristics of research as it is carried on in educational research agencies; 2) a basic knowledge of research methodology and related theory that will enable them to assist at all stages of educational research; and 3) the technical skill to carry out independently the operational aspect of educational research.

The objectives stated above and the related competencies are achieved through an integrated program of study. This program may be taken on a full- or part-time basis, and study may begin in any quarter. A full-time student will normally complete degree requirements in one academic or calendar year (three or four quarters). The culminating component of the program is the planning, executing, and writing up of research for a thesis, intended as a small-scale but original investigation into a significant educational problem. The thesis may be presented in one of several formats selected jointly by the student and the adviser.

All candidates will be required to complete the following program:

Master of Education Core (required of all candidates)

50.815 Research Design in Education (Area I)

Two courses from the remaining areas as described on page 47.

Educational Research Requirements

50.841 Introduction to Educational Statistics
50.842 Intermediate Educational Statistics
50.817 Advanced Research Design in Education
50.847 Introduction to Computer Programming: FORTRAN IV
50.891 Thesis (equivalent to two courses)
or
50.845-846 Independent Research Seminars I & II

Electives (three)

Human Development

The overall objective of this program is to provide opportunities for practicing and prospective educators to expand and deepen their knowledge and understanding of human development in its psychological and social aspects. Completion of the program does not lead to state certification, and a teaching certificate is not required for admission to the program. However, the program can provide a useful background for persons teaching, or planning to teach, psychology and behavioral science in secondary and elementary schools. It can also serve as introductory preparation for students who aspire to later doctoral study in the field of human development. Full-time students will take a maximum of four courses per term and will complete the program in a minimum of three quarters. Part-time students will take a maximum of two courses per term and will complete the program in a minimum of six quarters.

Candidates may begin study in any quarter and will be required to complete the following program:

Master of Education Core (required of all candidates)

50.815 Research Design in Education

Two additional courses, one from Area III (Social Foundations) and one from Area IV (Humanistic Foundations).

Human Development Requirements

50.806 Psychology of Learning
or
50.811 Psychology of Thinking
50.810 Psychology of Personality
or
50.805 Personality and Social Structure (if not taken in Ed.M. Core, above)
50.808 Seminar in Child Development
50.809 Seminar in Adolescent Development
50.819 Theories of Developmental Psychology

Electives (choice of courses or thesis):

Courses: four courses, chosen in consultation with an adviser, from those offered in the Graduate School of Education and other departments in the University

Thesis: 50.817 Advanced Research Design in Education
50.842 Intermediate Educational Statistics
50.891 Thesis (equivalent to two courses)

Rehabilitation Administration and Special Education

Rehabilitation Administration

This program is designed to prepare students for positions of administrative leadership and research in a wide range of rehabilitation and health care service agencies.

Students majoring in Rehabilitation Administration should anticipate taking 15 credit courses for the degree under either of the following options:

Plan A: For students with limited rehabilitation or administration experience.

The program will be conducted on a cooperative education basis. This means that the student will alternate periods of academic course work with paid practical experience in the field over a 21-month period.

Plan B: For students with considerable rehabilitation or administration experience.

The program takes one calendar year from September through August and includes four academic quarters. During this time the student also completes 500 hours of practical experience in the field. Under Plan B there are a limited number of federal stipends available which are issued on a competitive basis.

Plan C: For students with limited rehabilitation or administration experience who wish an alternative plan to cooperative education.

The program will take a minimum of two calendar years. During that time the student will elect his academic course work, 500 hours of practical field work experience, and a full-time internship experience.

Recommended Core Courses

50.805 Personality and Social Structure
50.807 Abnormal Psychology

Department Requirements

56.950 Introduction to Rehabilitation
56.951 Principles of Medical Rehabilitation
56.952 Rehabilitation and Social Services
56.953 Organization and Administrative Theory
56.961 Rehabilitation Administration I
56.963 Rehabilitation Administration II
56.832 Group Dynamics
56.960 Practicum in Rehabilitation Administration
56.956 Community Planning in Rehabilitation

Electives chosen from

56.957 Federal-State Relations in Rehabilitation
56.958 Social Welfare and Rehabilitation
56.959 Rehabilitation Research
56.962 Administration of a Sheltered Workshop
56.964 Rehabilitation and the Law
56.965 Occupational Placement
52.865 Systems Theory in Education
53.815 Rehabilitation Counseling Strategies

Interrelated Programs in Special Education

Interrelated programs in Special Education offer options to prepare for work with individuals having mild to moderate special needs (emotional disturbance, learning disabilities, mental retardation) or those having severe handicaps in one or more of the above areas. In addition, a concentration in preschool handicapped is available. For those planning to work outside the classroom with schools and/or public or private agencies, there is the program of Special Education Community Personnal (SECP).

In all but the SECP program, eligibility for certification at the elementary or secondary level is the prerequisite for a student to begin concentrating on the special education sequence. Students lacking the above may earn certification through satisfactory completion of prescribed courses in elementary or secondary education at Northeastern. Applicants certified at the secondary level may need additional preparation in areas of reading, mathematics, and methods and materials, at the elementary level, to obtain additional background for work with individuals with special needs.

Degree candidates must demonstrate competency in child psychology, abnormal psychology, and introductory statistics through previous course work or they will be required to complete such course work before graduating. The statistics course may be fulfilled by satisfactory completion of the programmed learning course in statistics given at the University.

An option leading to certification in a single area, providing the student enters the program with elementary or secondary teaching certification, or completion of the SECP program, will normally require four to five quarters of full-time graduate study, preferably beginning in the Summer Quarter. A student who needs to obtain the above certification should expect to spend additional time completing the program.

Field Work and Student Teaching or Practicum placements are an integral part of the Master's Degree program. All students are required to do two quarters of Field Work and one quarter of Student Teaching or Practicum. Educational settings utilized for field work include public and private schools, day and residential programs, and hospital-based educational facilities.

A sequenced program will be developed in consultation with the major adviser based upon the student's background, experience, and interests. It will include basic requirements of the graduate school, the Division, and the State Department of Teacher Certification, where appropriate. Massachusetts' State Department of Education is currently granting Letters of Approval until final certification requirements are established. Electives will be drawn from other programs as warranted.

Completion of all programs in special education is contingent upon the candidate's demonstration of competency in specified fields of knowledge and skills as measured by academic success and satisfactory completion of Field Work and Student Teaching or Practicum. A comprehensive examination will be taken during the quarter in which the student completes nine courses related to the Special Education degree, other than elementary or secondary teaching certification courses.

Students should apply for admission for either the summer or fall quarters. All admissions materials must be complete by April 15 for consideration for either of these two quarters.

Financial Aid — Traineeships

A limited number of traineeships through Federal grants is anticipated for 1976-1977. The student in need of financial help should discuss the matter during the interview with the Division faculty member. The Department has also attempted to develop paid internships in a variety of settings in order to offer students other opportunities for professional development as well as a means of financial assistance. Students selected for an internship will need to plan for a program extending over approximately two years. (Refer also to Financial Aid, page 30.)

Core Curriculum Requirements

In addition to the Foundations of Education core requirements described on page 47 and the prerequisites described above, the programs in the Division of Special Education have the following common core of required courses:

55.806 Language Disturbances in Children
56.807 Learning Disabilities
56.840 Psychology of Mental Retardation and other Handicapping Conditions
56.846-56.847 Special Education Methods and Materials Related to Measurement and Evaluation
56.880-56.881 Etiology and Development of Deviations in Special Needs Individuals
Field Work and Seminar
Student Teaching and Seminar or Practicum and Seminar

Any core curriculum requirement may be waived if, in the opinion of the adviser, the student has had an equivalent course.

Field Work and Student Teaching or Practicum are specific to the student's major interest. With the written approval of the student's adviser, a student who is approved, certified, or able to be approved in an area of Special Needs, will be required to do Field Work but may not be required to do Student Teaching. The program for each student is designed in relation to his educational and experiential background, his professional goals, and the limitations (such as approval and certification) implied by such goals.

Teacher Preparation Options

Generic Special Educator

This program option develops competencies (as delineated in Mass. Regulations for Interim Approval) as resource room and consulting teachers dealing with mildly involved special needs children.

Recommended Core Courses
50.815 Research Design in Education
50.808 Seminar in Child Development
50.805 Personality and Social Structure

Department Core Curriculum Requirements
see page 69.

Required Courses for Generic Special Educator
56.801 Alternatives for Providing Services for Special Needs Children
56.831 Teaching the Emotionally Disturbed

Further electives may be chosen in consultation with the student's academic adviser.

Field Work and Student Teaching assignments will concentrate on mild disabilities in resource room and diagnostic-prescriptive settings.

Emotional Disturbance — Learning Disabilities

This area of specialization prepares students to work with mildly to moderately handicapped pupils in a self-contained class or to work as a resource teacher where classes have been integrated.

Recommended Core Courses

50.815 Research Design in Education
50.808 Seminar in Child Development
or
50.807 Abnormal Psychology
50.805 Personality and Social Structure

Department Core Curriculum Requirements
see page 69.

Required Courses for Emotional Disturbance-Learning Disabilities

56.831 Teaching the Emotionally Disturbed

Further electives may be chosen in consultation with the student's academic adviser.

Field Work and Student Teaching assignments will concentrate on various educational and residential settings.

Mental Retardation — Learning Disabilities

This area of specialization prepares students to work with mildly to moderately handicapped pupils in a self-contained class or as a resource teacher in a school where classes have been integrated.

Recommended Core Courses

50.815 Research Design in Education
50.808 Seminar in Child Development
50.805 Personality and Social Structure

Department Core Curriculum Requirements
see page 69.

Required Courses for Mental Retardation-Learning Disabilities

56.841 Development and Implementation of Programs for the Moderately Handicapped

Further electives may be chosen in consultation with the student's academic adviser.

Field Work and Student Teaching assignments will concentrate on mild to moderate disabilities in resource room and self-contained classrooms.

Severely Handicapped

Students will be prepared to function as classroom teachers in a variety of settings. Classes may be situated in private or public schools or institutions. It is recognized that the functions of the student will vary greatly depending upon the classroom setting and the requirements of children in any given classroom situation. With this in mind, students will be prepared in certain core areas and then given more specialized training in working with the severely-handicapped. The courses and practicum experience required are designed to meet with standards developed by the Department of Education of the Commonwealth of Massachusetts and similar requirements throughout the country.

Required Core Courses
- 50.815 Research Design in Education
- 50.808 Seminar in Child Development
- 50.805 Personality and Social Structure

Department Core Curriculum Requirements
see page 69.

Multiply-Handicapped Program
- 56.835 Socio- and Psychodynamics of Family Life
- 56.838 Development and Implementation of Programs for the Severely Handicapped
- 56.839 Severely Handicapped

Electives are chosen from
- 56.847 Seminar in Mental Retardation
- 56.848 Early Childhood Learning Problems — Identification and Program Development
- 55.803 Cerebral Palsy
- 55.804 Aphasia
- 55.816 Test Procedures in Speech and Language Pathology
- 55.861 Neuropathology
- 62.842 Physical Education for Students with Special Needs
- 62.860 Early Childhood Motor Patterns
- 62.864 Perceptual Motor Development
- 62.884 Movement and the Learning Process

Early Childhood Handicapped

Teachers who complete this program may function in a variety of roles: (1) teacher in a self-contained handicapped early childhood classroom; (2) teacher of an integrated program; and (3) consultant to other teachers of young children.

Prerequisite

Certificate or eligibility for certification in Massachusetts to teach at the elementary level. (This may be waived if newly developed certification procedures do not require such certification.)

Prior training, preferably with experience in "regular" early childhood education. Students without this preparation may be admitted but will be required to take additional appropriate courses.

Required Core Courses

50.815 Research Design in Education
50.808 Seminar in Child Development
50.805 Personality and Social Structure

Departmental Core Curriculum Requirements

see page 69.

Courses for Preschool Handicapped Teacher Program

56.835 Socio- and Psychodynamics of Family Life
56.848 Early Childhood Learning Problems — Identification and Program Development
53.804 Counseling Theory and Practice

Special Education Community Personnel
(A Noncertification Program)

Northeastern University, Department of Rehabilitation and Special Education, in response to identified needs and national trends, offers a program for individuals with broad interests and abilities to prepare them to function as advocates for handicapped children and youth and to act as liaison between community agencies and the school.

Implied in such a program is the possession or acquisition of knowledge of social problems, teaching, community and school organization, child development, problems of multiple handicaps, and facilities for care, treatment, and remediation. Implied also are skills in working with the handicapped, with peers in numerous professions, and with techniques of survey research. Integrated course and field work experiences will be designed to complement each applicant's background of education and experience. Approximately four to five quarters are estimated for demonstration of competence in the specified areas.

Recommended Core Courses

50.810 Psychology of Personality
50.820 Seminar in Contemporary Issues in American Education

Department Requirements

56.880-881 Etiology and Development of Deviations in Special Needs Individuals
56.840 Psychology of Mental Retardation and Other Handicapping Conditions
56.807 Learning Disabilities
56.853 Field work and Seminar
56.854 Practicum

Electives chosen from
- 56.952 Rehabilitation and Social Service
- 56.956 Community Planning in Rehabilitation
- 56.835 Socio- and Psychodynamics of Family Life
- 56.839 Severely Handicapped
- 56.845 Rehabilitation and the Special Education Teacher
- 51.920 Methods and Materials in Adult Literacy Education

Other courses in consultation with adviser.

Speech Pathology and Audiology

The program leading to the degree of Master of Education in either Speech Pathology or Audiology is designed to qualify candidates for membership in and certification by the American Speech and Hearing Association. Graduates of the program are also qualified for further graduate study and for employment as speech pathologists or audiologists in clinics, hospitals, public schools, and rehabilitation centers.

This program assumes that students have completed an undergraduate program in speech and hearing. Such students, who have had the necessary academic preparation and a minimum of 150 clock hours of clinical practice, may expect to devote a minimum of five or six academic quarters to complete the practicum requirement. Students who do not have the proper academic and clinical background on the undergraduate level may expect to devote a minimum of seven or eight academic quarters to complete the practicum requirements. Applicants should specify a major in either Speech Pathology or Audiology.

This program is conducted with the cooperation of a large number of community agencies.

Speech Pathology

Each student's program is individually designed with the assistance of a faculty adviser to assure that course work is distributed in all major professional areas including: diagnostics, articulation, language, fluency, voice, and audiology. The student is also advised about how his program prepares him to meet certification requirements established by the American Speech and Hearing Association.

Master of Education Core (required of all candidates)
- Three courses as defined on page 47.
- 55.813 Advanced Clinical Practice

Speech Pathology Courses

A minimum of nine courses selected from the following or appropriate electives:
- 55.803 Cerebral Palsy
- *55.804 Aphasia
- 55.805 Disorders of Voice

*Required or an equivalent graduate level course.

*55.806 Language Disturbances in Children
55.811 Clinical Management in Stuttering
*55.812 Differential Diagnosis in Speech and Language Pathology
*55.816 Test Procedures in Speech and Language Pathology
55.817 Advanced Anatomy, Neurology and Physiology of Speech-Hearing Mechanism
55.822 Seminar in Oro-facial Anomalies
55.823 Psycho-social Aspects of Communication Disorders
55.861 Neuropathology
55.824 Seminar in Speech Pathology
55.860 Aphasia Rehabilitation
55.863 Advanced Study of Articulation Disorders
55.891 Thesis (optional)
55.899 Directed Study (optional)

Satisfactory completion of a comprehensive examination is a requirement of this program.

Audiology

Each student's program is individually designed with the assistance of a faculty adviser to assure that course work is distributed among evaluation, diagnosis, and aural rehabilitation. The student is also advised about how this program prepares him to meet certification requirements established by the American Speech and Hearing Association.

Master of Education Core (required of all candidates)

Three courses defined on page 47.

55.813 Advanced Clinical Practice

Audiology Courses

A minimum of nine courses selected from the following or appropriate electives:

55.814 Clinical Audiometry I
55.815 Clinical Audiology
*55.817 Advanced Anatomy, Neurology, and Physiology of Speech-Hearing Mechanism
*55.818 Pathologies of the Ear
55.819 Clinical Audiometry II
55.820 Physiological Acoustics
55.821 Seminar in Audiology
55.823 Psycho-social Aspects of Communication Disorders
55.862 Psycho-acoustics
55.825 Teaching Speech to Deaf Children
55.826 Teaching Language and Reading to Deaf Children
55.828 Aural Rehabilitation
55.891 Thesis (optional)
†5.899 Directed Study (optional)

Satisfactory completion of a comprehensive examination is a requirement of this program.

*Required or an equivalent graduate level course.

Teaching the Deaf

The following curriculum in the preparation of teachers of the deaf is offered in affiliation with the Boston School for the Deaf. Candidates lacking prerequisite courses will be required to complete them prior to the following program.

Master of Education Core (required of all candidates)

Three courses as defined on page 47.

Teaching the Deaf Requirements

55.814 Clinical Audiometry I
55.815 Clinical Audiology
55.816 Test Procedures in Speech and Language Pathology
55.825 Teaching Speech to the Deaf
55.826 Teaching Language and Reading to the Deaf
55.827 Methods and Materials in Deaf Education
55.828 Aural Rehabilitation
55.852 Practicum: Teaching the Deaf (8 quarter hours)

NONDEGREE PROGRAM FOR CERTIFICATION OF ELEMENTARY AND SECONDARY TEACHERS

This program is designed to qualify college graduates for certification as elementary or secondary teachers in the Commonwealth. Students who are interested in qualifying to teach in other states should obtain a copy of that state's certification requirements and bring it to the initial interview with their advisers.

This program is open to individuals who meet the general admission requirements for the Master of Education degree. In addition, students whose backgrounds may not include an approved course in such areas as human development or learning must take such a course either before they enter the program or before student teaching. Furthermore, candidates for secondary certification must have completed, before admission, 36 quarter hours of courses in the field in which they are preparing to teach, with a QPA for all courses taken in that field of at least 2.000. No special students will be admitted to these courses; no transfer of courses or credit will be allowed.

This is a part-time, integrated, one-year program which begins in the Fall Quarter and continues through the following Winter and Spring Quarters. It requires that a student attend classes two nights a week during the Fall and Winter Quarters and spend full-time (days) as a student teacher in a school during the Spring Quarter.

The program consists of a sequence of inter-related activities led by a team of teaching specialists in elementary and secondary education and in the fields of mathematics, English, reading, science, and history and the social sciences.

Course Sequence
(The courses must be taken in the order listed):
Fall Quarter
51.800 Principles of Teaching
51.863 Methods and Materials for Teaching Children I
or
51.865 Methods and Materials for Teaching Adolescents and Adults I
Winter Quarter
51.801 Curricula of American Schools
51.864 Methods and Materials for Teaching Children II
or
51.866 Methods and Materials for Teaching Adolescents and Adults II
Spring Quarter
51.805 Student Teaching with Related Seminar
Applications for Student Teaching must be received by the Director of Field Placement no later than October 15.

This program does not lead to any degree. However, applicants who are able to be full-time graduate students may apply for simultaneous admission to most programs requiring certification in the Graduate School of Education. Such students may take one or two courses in the degree program along with the certification courses (except during the Student Teaching quarter when no courses may be taken), but must complete certification requirements during the first year of study. Twelve quarter hours (3 courses) taken in the nondegree program may be used as electives in a master's program subject to approval of the adviser. Students who cannot devote full-time to graduate study may apply to master's degree programs after successful completion of the certification program.

CERTIFICATE OF ADVANCED GRADUATE STUDY

The Certificate of Advanced Graduate Study is available to applicants who have demonstrated a strong background in the special field of study at the master's level and who meet the specific requirements of the Graduate School of Education and the appropriate department. CAGS programs are offered in the areas of:

Counselor Education
Pupil Personnel Services Administration
School Psychology
Counseling
School
College
Community Mental Health
Rehabilitation
Educational Administration
Cooperative Education
Educational Administration

Higher Education
Instructional Technology
Rehabilitation and Special Education Administration

All students must complete one of the programs as outlined in the following pages. In most cases, the sequence is designed to be very flexible. Any variations or changes must have the prior recommendation of the major adviser and approval of the Director of the Graduate School of Education.

Counselor Education

The CAGS represents a second year of preparation beyond the master's degree for the counseling and human services field. This is not a predoctoral program but a terminal professional degree program. There are several major options in the Counselor Education Department: Pupil Personnel Services Administration, School Psychology, and Counseling (School, College, Community Mental Health, Rehabilitation). Students with master's degree work in rehabilitation counseling who wish to emphasize administrative preparation at the CAGS level should enter the Rehabilitation Administration program.

Each of these counselor education program concentrations presumes master's level preparation in counseling the equivalent of that offered at the University. Students whose master's program in Counselor Education lacked a practicum will be required to take 53.805-53.806 in addition to the minimum course requirements for the CAGS. Students with master's degrees in fields other than counseling will, if otherwise admissible, be required to make up a minimum of five courses from the master's program. These students will need a minimum of two years to complete the requirements for the CAGS.

In addition to the course requirements, students must pass a comprehensive examination (written and/or oral) before the certificate will be awarded.

After filing all application materials required by the Graduate School, applicants will be contacted by the Department to arrange for admissions interviews. Since there is a limited number of spaces in the CAGS program, early application is urged.

Pupil Personnel Services Administration

Students who have prepared themselves for school counseling positions and who are interested in leadership positions in guidance and pupil personnel services should choose this option. The program provides for further work in counseling, but emphasizes administrative and organizational preparation for the effective delivery of personnel services to students. Field work placements will provide for the development of skills and knowledge in planning, supervision, and delivery of services within the context of the total educational program of the school system.

A typical program is as follows:

53.840-53.841 Advanced Field Work
53.834 Advanced Theories of Behavior Change
53.833 Seminar in Counseling Supervision and In-Service Education
53.807 Administration of Guidance Services
52.810 Leadership I
52.811 Leadership II
52.831 Innovation and Change in American Public Schools
52.832 The Process of Adminstration
Three Electives

Counseling

Students whose primary interest is the delivery of individual and group counseling services in a variety of settings, including, but not limited to, schools, college counseling centers, rehabilitation, and mental health centers, should choose this option. This program provides for a more "therapeutic" orientation but is not as focused on a particular setting or category of settings. Field placements will provide for the development of the student's individual and group counseling skills and will be varied according to individual need and interest. Mental health settings will tend to predominate in the field assignments.

A typical program for School, College, and Community Mental Health Counseling is as follows:

53.840-53.841 Advanced Field Work
53.834 Advanced Theories of Behavior Change
53.816 Psychological Counseling Strategies
53.818 Case Studies in Marriage and Family Counseling
53.831 Advanced Group Counseling
53.835 Psychodiagnostic Measures
50.819 Theories of Developmental Psychology
50.807 Abnormal Psychology
Three Electives

A typical program for Rehabilitation Counseling is as follows:

53.840-53.841 Advanced Field Work
53.834 Advanced Theories of Behavior Change
53.831 Advanced Group Counseling
53.818 Case Studies in Marriage and Family Counseling
56.980 Psychological Problems of Disability
56.982 Essentials of Case Management and Supervision
56.983 Rehabilitation of Alcoholic and Drug Dependent
56.984 Rehabilitation of the Penal Offender
Three Electives

School Psychology

The course offerings and field experiences in this program are designed to prepare students as school psychologists. In accordance with Massachu-

setts certification requirements, the goal is to develop professional competencies necessary for providing direct, specific, and practical assistance to students, classroom teachers, parents, and other school personnel in promoting an optimal psycho-educational experience. In addition to the general Certificate of Advanced Graduate Study admission requirements, applicants for the School Psychology program must have at least 24 semester hours (32 quarter hours) of undergraduate work in psychology and a master's degree in a psychology-related field.

This specialization is sponsored jointly by the Graduate School of Education and the Department of Psychology in the College of Liberal Arts. Applicants for this program will be interviewed by both the Department of Counselor Education and the Department of Psychology. The admitted student will be assigned an adviser from one of these two departments who will plan the student's program.

Courses to meet the degree and certification requirements will be selected from the Graduate School of Education and the Department of Psychology to reflect the following areas of study: learning theory, counseling strategies and interviewing, psychodiagnosis, remediation, special education, curriculum, organizational development, school structure, psychopathology, human development.

Two years of field experience as a school psychology trainee under the supervision of a certified school psychologist are required.

A typical program is as follows:

53.843-53.844 School Psychology Field Work
51.870 Developmental Reading and Writing or
51.871 Reading and Language Disabilities I
56.840 Psychology of Mental Retardation and other Handicapping Conditions
19.822 and 19.823 Psychopathology I and II
53.835 Psychodiagnostic Measures
53.821 Psychoeducational Prescriptions
53.820 Seminar in School Psychology
Two courses in Personality and Development
*Elective(s)

*The number and selection of electives will depend upon the student's master's degree program content and state certification guidelines.

Educational Administration

Beyond the master's degree level, four advanced administrative training programs at the Certificate of Advanced Graduate Study (CAGS) level are offered. These programs are in the fields of cooperative education, educational administration, higher education, and instructional technology.

Cooperative Education

A program of study at the master's level in the area of cooperative education is located in the Counselor Education Department. The program

offered here is an advanced one aimed at the preparation of administrators of cooperative education programs in a variety of settings: the public schools, vocational-technical schools, and junior colleges, as well as at other institutions of higher learning.

A typical program is as follows:

Required Core

52.830 Current Issues in Educational Administration
52.831 Innovation and Change in Amercan Public Schools
52.832 The Process of Administration
51.900 Cooperative Education in America
52.824 The Adminstration of Cooperative Education

Electives

A minimum of seven to be selected in consultation with the student's adviser. These courses will be drawn from the appropriate areas of administration, counselor education, or other related offerings depending upon the student's career goals in settings such as: colleges, junior colleges, public schools, and other educational agencies.

Upon completion of this program, a comprehensive examination is given to each student.

Educational Administration

The Certificate of Advanced Graduate Study (CAGS) program in Educational Administration is designed to provide the student with a closer examination of a particular administrative or supervisory position. Extending beyond the generic master's degree program, major emphasis is given to role specialization and the particular skills that should be acquired by prospective and practicing school administrators. Completion of this program should develop further the leadership capabilities essential to the student's area of specialization such as: the principalship of a large school; the assistant superintendency; the superintendency of a small district or supervisory union; directorship of federal, system-wide or state education department programs.

A minimum of 12 courses beyond the master's degree is required for completion of the program as well as satisfactory completion of a comprehensive examination.

Core Courses (required)

52.830 Current Issues in Educational Administration
52.831 Innovation and Change in American Public Schools
52.832 The Process of Administration

Electives

52.834 Educational Finance
52.835 School Business Management
52.836 Personnel Administration
52.837 School-Community Relations
52.838 School Plant Planning, Operation, and Maintenance

52.840 Problems in School Administration: A Simulated Experience — The Superintendency
52.842 Problems in School Administration: A Simulated Experience — Assistant Superintendent for Instructional Services
52.899 Direct Study
52.843 Administrative Internship
52.844 School Law
52.865 Systems Theory in Education
52.866 Politics and Educational Decision Making
Other electives approved by adviser

Higher Education

This program of study is directed toward the training of college administrators. Emphasis is placed on the development of attitudes, understandings, and skills necessary to prepare the potential administrator and to give this development the necessary philosophic base on which the administrator can build an effective career.

A typical program is as follows:

Required Core

52.830 Current Issues in Educational Administration
52.831 Innovation and Change in American Public Schools
52.832 The Process of Administration

Electives

A minimum of nine to be selected in consultation with the student's adviser. These courses will be drawn from appropriate areas of administration, counselor education, and other related offerings depending upon the particular higher education specialization of the student.

Upon completion of this program, a comprehensive examination is given to each student.

Instructional Technology

The Certificate of Advanced Graduate Study (CAGS) program in Instructional Technology is designed to provide the student with advanced administrative and instructional technology skills. Four areas of contact are integrated into this advanced program. A broad exposure is presented in the field of educational administration through the core courses. Instructional technology electives provide the student with advanced techniques of using modern technology for instructional purposes. By means of educational administration electives, reasonable depth is provided in such areas as finance, physical facilities, and community relations. And finally, by means of additional electives throughout the University, further contacts and expertise may be attained.

Upon completion of this advanced program, the student is prepared to assume top leadership in the field of instructional technology in central office positions of a public school system as well as directorship of such

specialized programs in industry, government, institutions of higher learning, and privately operated instructional programs in urban settings.

A typical program is as follows:

Educational Administration Core Courses (3)

52.830 Current Issues in Educational Administration
52.831 Innovation and Change in American Public Schools
52.832 The Process of Administration

Instructional Technology Electives (minimum of 4 as approved by the adviser)

Educational Administration Electives (minimum of 4 as approved by the adviser)

Electives (optional number)

Upon completion of the above program, a comprehensive examination is given to each student.

Rehabilitation and Special Education

Rehabilitation Administration

The CAGS Program in Rehabilitation Administration is offered for students who already possess a master's degree in rehabilitation administration or its equivalent. It is intended to enable a student to develop advanced skills in the areas of program planning, decision making, communication and research design in administration. In addition, the educational experience will be substantively focused in areas of service to fields of corrections, alcohol and drug addiction, geriatrics, and social welfare.

A minimum of twelve (12) courses beyond the master's degree is required for completion of the program. In addition to course requirements and demonstration of competencies in both academic and practicum areas, students must pass a written and/or oral comprehensive examination before the certificate will be awarded.

Departmental Core Courses (Required)

56.959 Rehabilitation Research
56.980 Psychological Problems of Disability
56.981 Administrative Problems in Rehabilitation
56.986 Critical Issues in Rehabilitation Administration

Electives

56.982 Essentials of Case Management and Supervision
56.983 Rehabilitation of the Alcoholic and Drug Dependent
56.984 Rehabilitation of the Penal Offender
56.985 Rehabilitation of the Geriatric Client
52.832 The Process of Administration
52.836 Personnel Administration
52.843 Administrative Internship
52.899 Directed Study
56.832 Group Dynamics

Special Education Administration

An interrelated program at the CAGS level is designed to prepare administrators of Special Education programs in public schools and in local and state institutions and agencies.

Students entering the CAGS program in Special Education Administration must have a master's degree, equivalent to that offered at the University, in one or more areas of special education and at least three years of classroom experience. Some students may have to take prerequisite courses to satisfy deficiencies.

Core Requirements

52.830 Current Issues in Educational Administration
52.831 Innovation and Change in American Public Schools
52.832 The Process of Administration
56.953 Organization and Administrative Theory

Department Requirements

56.952 Rehabilitation and Social Services
56.870 Administration and Supervision of Special Education
56.839 Severely Handicapped
56.956 Community Planning in Rehabilitation
52.843 Administrative Internship

Electives

56.832 Group Dynamics
52.813 Instructional Leadership: Curriculum Development and Supervision
56.959 Rehabilitation Research
52.865 Systems Theory in Education
52.835 School Business Management

A minimum of twelve (12) courses beyond the master's degree is required for completion of the program.

In addition to course requirements and demonstration of competencies in both academic and practicum areas, students must pass a written and/or oral comprehensive examination before the certificate will be awarded.

DOCTOR OF EDUCATION

The Doctor of Education (Ed.D.) degree program in Leadership: Administration and Supervision is offered jointly by various departments within the College of Education and brings together a functional part of each into a single entity. The area of study, administration and supervision, is appropriate to any candidate seeking a terminal degree in the related fields of school administration, rehabilitation administration, and higher education administration. Each degree candidate is involved in an academic experience that is an individually developed program of courses

and activities. Such study will contribute to an integration of knowledge about the theoretical and pragmatic learnings pertaining to the chosen field of endeavor.

Specific concentrations may be found in elementary and secondary school administration, school central office administration, administration of special education, and pupil personnel administration. In addition to the wide range of school administrative and supervisory specializations, other program concentrations include rehabilitation administration, administration of community, junior and four-year colleges, administration of cooperative education, student personnel administration, and general educational administrative planning and development.

Although each student's program is individually developed, some general requirements apply to all. The program consists of approximately seventy-six quarter hours of study beyond the master's degree. In addition to course requirements, each student is expected to complete three quarters of full-time study in residence. Two of these quarters must be consecutive (one of which may be in the Summer Quarter), the third may occur at any time in the program or may be fulfilled through a fulltime internship. In each student's program, the major field of study must be complemented by two minor areas of study from offerings in the College of Education and other colleges within the University. Each student is expected to complete a doctoral dissertation.

The Doctor of Education degree is awarded to candidates who present evidence of proficiency, high attainment, and research, competence in their area of specialization, and who also demonstrate potential for professional educational leadership.

Following is the general type of program format that will be developed for each student.

PROGRAM OF STUDIES

Leading to the Doctor of Education Degree in Leadership: Administration and Supervision

Courses

Required Core (required of all students)

52.850 Doctoral Seminar in Leadership: Administration and Supervision I

52.851 Doctoral Seminar in Leadership: Administration and Supervision II

52.852 Doctoral Seminar in Leadership: Administration and Supervision III

Program Specialization (minimum of 32 quarter hours)

A planned sequence of courses in the student's specific area of concentration, i.e.,

School Administration
Rehabilitation Administration
Higher Education Administration
Cooperative Education Administration
Special Education Administration
Pupil Personnel Administration

Outside Minor Supporting Area (minimum of 12 quarter hours)
A planned sequence of graduate courses from departments within the University, but outside the College of Education.
Inside Minor Supporting Area (minimum of 12 quarter hours).
A planned sequence of graduate courses within the College of Education, but outside the student's main area of concentration.

Dissertation and Dissertation Seminar (required of all students).

In addition to these general program requirements, each student will be expected to complete a qualifying examination, provide evidence of intermediate statistical proficiency, pass final comprehensive and oral examinations. These requirements are described elsewhere in the catalog.

description of courses

All courses carry four quarter hours of credit unless indicated otherwise. Please see the current schedule for Summer, Fall, Winter, and Spring Quarter listings.

FOUNDATIONS OF EDUCATION

50.801 Educational Anthropology
Examination of schooling as a particular variety of socialization, with special attention to characteristics of societies that rely heavily on formal instruction, contrasted with less deliberately patterned techniques of child-rearing. Readings will be mainly cross-cultural, ethnographic, and historical. The emphasis of the course varies from quarter to quarter, and will be announced in the registration materials distributed in advance of each quarter. (core course)

50.802 Sociology of Education
The functioning of educational institutions in their social and cultural milieu will be examined from anthropological and sociological perspectives. The school as a social system; influence of the stratification system, youth cultures, and racial antagonisms upon the educational enterprise. (core course)

50.803 Child Psychology
A review of the principles of child development from birth to pre-adolescence. Particular emphasis will be placed on intellectual, social, and emotional development. The theoretical formulations of psychoanalysis, social learning theory, and Piaget will be discussed in the context of relevant research in these areas, as well as their educational implications. (core course)

50.804 Adolescent Psychology
Social, emotional, and intellectual development through the adolescent years. Problems in family relationships and in the adolescent's social environment as well as his adjustment in school. Case history material. (core course)

50.805 Personality and Social Structure
Human behavior from a combined psychodynamic and sociological point of view, with special emphasis on socialization and the relations between the individual and the collectivity. The integration of relevant theories from psychology, sociology, and anthropology. *Suggested Prep. a course in sociology, cultural anthropology, or social psychology.* (core course)

50.806 Psychology of Learning
The basic principles and conditions of acquisition, retention, and transfer of learning. *Suggested Prep. a course in psychology.* (core course)

50.807 Abnormal Psychology
How personality becomes disordered. Problems of neurosis, character disorders,

psychosomatic disorders, and psychoses. Current methods of clinical diagnosis and treatment will be reviewed. (With the approval of the adviser, may serve as a core course for students majoring in Counselor Education, Rehabilitation Administration, Special Education, Speech Pathology and Audiology.)

50.808 Seminar in Child Development
A seminar course with emphasis on discussion of child development theories with special reference to personality and cognitive development. Critical evaluation of research related to child development theories with particular emphasis on recent trends, new approaches, and relevance to educational theories and practices. *Prep. a course in child psychology or human development.* (core course)

50.809 Seminar in Adolescent Development
A seminar course with emphasis on discussion of major problem areas facing the adolescent in our society today. Particular emphasis will be given to social and emotional development. Included will be a survey of research in such areas as psychoanalysis, social learning, morality, and delinquency. *Prep. a course in adolescent psychology or human development.* (core course)

50.810 Psychology of Personality
An examination of theoretical approaches to the study of personality, with emphasis upon theories dealing with dynamic factors in personality development. The role of social and cultural factors, as well as implications as various theories for the therapeutic processes, will be considered. *Suggested Prep. a course in psychology.* (core course)

50.811 Psychology of Thinking
A consideration of the processes involved in cognitive organization and functioning. Topics will include: language, concept formation, and problem solving. *Suggested Prep. a course in psychology.* (core course)

50.812 History of Education
An opportunity to explore some of the historical roots of contemporary educational theory and practice, with a focus on selected aspects of educational history from antiquity to the present. Also, an opportunity to utilize knowledge gained for the development of a personal educational position. (core course)

50.814 Nature and Theory of Psychological and Educational Measurement
An examination of the logic of measurement and the nature of human capacities, aptitudes, and abilities. Characteristics of tests, ratings, questionnaires, and similar instruments are reviewed with emphasis on their reliability, validity, and useability. Item analysis procedures and test standardization are covered.

50.815 Research Design in Education
An introduction to scientific methods of research in education and related fields. Stress will be placed on critical reading and understanding of research literature, formulating research hypotheses, constructing a research proposal, and carrying out an individual or group project. This course must be included among the first six courses taken by each student. (core course)

A course in statistics, or competence in this field, as demonstrated by successful completion of a statistics proficiency exam, is required prior to taking this offering. A

no-credit, no-charge programmed course in statistics has been arranged for this purpose and is available through the University's Learning Center, 406 Dodge. The regular tuition course, 50.841, is also available. Students choosing the proficiency exam route may also use the services of a special teaching assistant who has been appointed to advise and assist them. The office hours and location of the teaching assistant will vary from quarter to quarter and may be obtained from the Foundations Department Secretary in 306 Cushing.

50.817 Advanced Research Design in Education
Each student will identify a research problem, review the relevant research literature, design an appropriate methodology, and prepare a written research proposal. *Prep. 50.815 Research Design in Education*

50.818 Comperative Education
Introduction to education in other nations, and exploration of its relationships with the political, economic, social, and cultural milieu. Selected countries in Western and Eastern Europe, South America, and Africa will be considered. (core course)

50.819 Theories of Developmental Psychology
The major developmental theories and related research of Havighurst, Erickson, Piaget, and others. *Prep. permission of instructor.*

50.820 Seminar in Contemporary Issues in American Education
Discussion of selected issues in contemporary American education such as school desegregation, compensatory education, learning problems of the disadvantaged, professionalization of teachers, etc. Review of relevant research and opinions. The topic or topics of the seminar for a particular quarter will be announced in the registration materials distributed in advance of that quarter. (core course)

50.821 Sex Roles in Education
This course identifies and examines some of the major issues related to sex roles in both the formal and informal educational systems of our society. Topics that will come under special scrutiny include: development of sex role patterns in the home and preschool and through children's books, games, and television programs; life for boys and girls in the elementary and high school classroom; sex bias in counseling and in vocational guidance and training; changes in traditional family roles and occupation hierarchies; assets and liabilities of coeducational and single sex education. The course will also allow students, in small groups, to explore their own sex role attitudes and the strategies they use to socialize young people.

50.822 Topics in the Philosophy of Education
A study of the basic assumptions underlying statements of educational content, process, and aims. Materials to be subjected to philosophical analysis are selected from educational and philosophic writings according to themes (e.g., authority and freedom, "growth" as an educational objective, the nature of educational relationships). The themes dealt with vary from quarter to quarter, depending on the concerns and interests of students and instructor. Brief lectures, mostly discussion. (core course)

50.841 Introduction to Educational Statistics
Basic descriptive statistics for measurement and research. Topics include use of

statistical notation, measures of central tendency and variability, probability and sampling techniques, theoretical distribututions, linear regression and correlation, and an introduction to statistical inference. (This course, or completion of a statistics proficiency examination, is required for admission to 50.815 Research Design in Education.)

50.842 Intermediate Educational Statistics
Statistical inference of normal populations and discrete data; estimation; testing of hypotheses; multiple correlation; analysis of variance and covariance; contingency; the chi-square test and other non-parametric tests. Emphasis is given to application in educational research. *Prep. completion of an introductory course in statistics or completion of a proficiency examination in statistics or permission of instructor.*

50.845-846 Independent Research Seminars I and II (4 quarter hours each)
Focus is on the design, conduct, analysis, and reporting of data from an individual research project. This project may be original or secondary, applied, theoretical, or action research and must be substantially larger in scope than that accommodated by Directed Study. Evaluation will be based on oral and written interim reports in Seminar I and oral and written final reports in Seminar II. This course will serve as an option to the thesis requirement only for students enrolled in the master's degree program in Educational Research.

50.847 Introduction to Computer Programming: FORTRAN IV
A laboratory course designed to develop facility in the use of a wide range of data processing equipment in educational research. Students will be introduced to the basic principles of computer programming, but emphasis will be placed on the applicability and use of existing statistical programs.

50.850 Communications Theory
An introduction to communications theory, covering models of the communication process, attitude changes, information, innovation, dissemination and flow, communication modalities, and language processing. (core course)

50.891 Thesis
A research activity that may be elected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

50.892 Dissertation Seminar
This seminar is open only to doctoral candidates who are ready to begin work on their dissertations. Although the dissertation proposal is formulated independently of the seminar, with the doctoral adviser and committee, this seminar will aid in proposal development and provide information on methodology, style, and mechanics of dissertation writing. *Prep. course in research methods in education (50.815 or equiv.) or permission of the instructor.*

50.895 Institute in Foundations of Education
(See general institute description on page 122.)

50.898 Workshop in Foundations of Education
(See general workshop description on page 123.)

50.899 Directed Study
This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the Department. *Prep. approval of the Chairperson of the Department and of the Director of the Graduate School of Education. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)*

CURRICULUM AND INSTRUCTION

51.800 Principles of Teaching
A consideration of the rational bases for effective teaching. Efforts are made to relate learning theory and educational objectives to various strategies and tactics of teaching. The functions of the teacher are examined as components of learner development. *Prep. must be taken concurrently with 51.863 Methods and Materials for Teaching Children I or 51.865 Methods and Materials for Teaching Adolescents and Adults I.* Offered Fall Quarter only. (Open only to students in the Nondegree Certification Program.)

51.801 Curricula of American Schools
Methods of organizing material to be learned at the state, district, school, and classroom level to meet the needs and to match the abilities of the students. Attention will be given to innovative practices which are found both within and outside of the public school system. *Prep. 51.800 Principles of Teaching; must be taken concurrently with 51.864 Methods and Materials for Teaching Children II or 51.866 Methods and Materials for Teaching Adolescents and Adults II.* Offered Winter Quarter only. (Open only to students in the Nondegree Certification Program.)

51.802 Procedures of Evaluation
Consideration is given to evaluation as a process for the improvement of learning and instruction. The course concerns itself with such topics as how to measure and evaluate affective, psycho-motor, and cognitive dimensions of student growth; test construction; collecting and administering standardized tests; various bases of grading; and methods of reporting student progress.

51.805 Student Teaching with Related Seminar (8 quarter hours)
A University-arranged practicum of observation and teaching in schools offering comprehensive programs within reasonable commuting distance of the University. Participating on a full-time basis, the student is expected to develop planning and communication abilities within his major field. Biweekly seminars at the University provide additional opportunity to analyze theory-practice relationships and to examine generic problems of teaching. *Prep. course in child or adolescent psychology; 51.800 Principles of Teaching; 51.801 Curricula of American Schools; 51.863-864 Methods and Materials for Teaching Children I & II or 51.865-866 Methods and Materials for Teaching Adolescents and Adults I & II.* Generally completed during the Spring Quarter. (Open only to students in the Nondegree Certification Program.)

51.810 Modern Topics in Elementary School Mathematics
An introduction to the modern elementary school mathematics curriculum for teachers and students preparing to teach, who are not acquainted with these topics.

51.811 Mathematics of the Primary Grades
The concepts of arithmetic and geometry found in modern mathematics courses for grades K-3. *Prep. teaching experience.*

51.812 Mathematics of the Middle Grades
The concepts of arithmetic and algebra found in modern mathematics courses for grades 4-6. *Prep. teaching experience.*

51.813 Informal Geometry for Teachers
The concepts of geometry found in the modern mathematics curriculum of grades 4-8. *Prep. teaching experience.*

51.824 The Teaching of Geometry in the High School
A study of students, teaching methods, and courses in geometry, with re-examination of selected background topics, including two-value logic, methods of proof, postulational systems, and analytical methods.

51.825 Seminar in Mathematics Education
Each student is expected to analyze a mathematics learning problem, to investigate relevant research, and to prepare materials embodying his own proposed solution. *Prep. permission of instructor.*

51.830 Concepts of Earth Science for Elementary Teachers
Selected topics in the earth sciences considered from a philosophical and/or historical point of view, to illustrate and emphasize man's interrelationship with his ecological environment; with laboratory work. (51.830, 51.831, and 51.832 are not sequential, and may be taken in any order.)

51.831 Concepts of Biology for Elementary Teachers
Selected topics in the biological sciences considered from a philosophical and/or historical point of view; a realistic consideration of man's place in his biological world; with laboratory work. (51.830, 51.831, and 51.832 are not sequential, and may be taken in any order.)

51.832 Concepts of Physical Sciences for Elementary Teachers
Selected topics in the physical sciences considered from a philosophical and/or historical point of view; the appraising of claims and counter-claims relative to the pollution of man's physical environment; with laboratory work. (51.830, 51.831, and 51.832 are not sequential, and may be taken in any order.)

51.837 Curriculum Problems in Science and Mathematics Education
The process of identifying problems and evaluating proposed solutions, taking into consideration the needs of the student population, the dichotomy of theory and applications in course design, and the role of common processes and conceptual schemes in integrating seemingly disparate courses. Traditional and modern programs will be investigated in terms of the problems they were designed to solve, their success or failure in this mission, and the relevance of such programs to present problems. *Prep. teaching experience or certification.*

51.838 Seminar in Science and Mathematics Teaching
The analysis and evaluation of a number of types of teaching strategies and learning materials, including laboratory materials and techniques, printed matter of all types, games, kits, multimedia materials, and interactive computer programs. Each student will be expected to undertake an extensive project applying his knowledge of strategies and materials to the achieving of previously identified objectives and ap-

propriate to a given class, group, or individual student. *Prep. teaching experience or certification.*

51.839 Implementing Change in Science and Mathematics Education
The planning, organization, and execution of in-service experiences for teachers, related to all phases of science and mathematics education from subject-matter courses to curriculum planning to materials workshops. *Prep. teaching experience or certification.*

Recommended: 51.837 Curriculum Problems in Science and Mathematics Education, 51.838 Seminar in Science and Mathematics Teaching, and 51.881 The Dynamics of Curriculum Development.

51.842 The English-Language Arts Curriculum
The design and function of the English-language arts curriculum; selected current issues as they impinge upon the English-language arts curriculum; the design and function of research in the English-language arts curriculum. Open to certified or experienced teachers; required of all candidates for the Master of Education in Curriculum and Instruction: English, and the Master of Education in Curriculum and Instruction: Language Arts. *Prep. permission of instructor.*

51.843 Literature in the English-Language Arts Curriculum
The historical-social, psychological, personal, archetypal, textual, biographical, and philosophical-moral aspects of literary study and their relation to the chronological, thematic, and generic demands of the literature program; the sources of interest in literature as they relate to the young reader and their implications for the English-language arts curriculum; the inter-relatedness of literature and the other components of the English-language arts curriculum. Each student will identify and investigate an area of individual interest. *Prep. 51.842, The English-Language Arts Curriculum or permission of instructor.*

51.844 Writing in the English-Language Arts Curriculum
The cognitive and affective bases of imaginative and non-imaginative writing; the role of writing in the relationship between self and object; modes of imaginative and non-imaginative writing appropriate to the young writer; the impulse to expression in the young writer and its implications for the English-language arts curriculum; the inter-relatedness of writing and the other components of the English-language arts curriculum. Each student will identify and investigate an area of individual interest. *Prep. 51.842, The English-Language Arts Curriculum or permission of instructor.*

51.846 English as a Second Language I
First course in teaching ESL, introducing the basic linguistic, cultural, and psychological concepts. Analysis of current approaches to teaching ESL locally and internationally from the standpoint of diagnosis, grouping, use of particular methods, and materials. Observations of local ongoing ESL programs will be included. *Prep. 51.871 Reading and Language Disabilities I or permission of instructor.*

51.847 English as a Second Language II
Second course in the ESL sequence which emphasizes innovative means in teaching ESL. Specific projects according to student need and interest will be developed; supervised clinical work. *Prep. 51.846 English as a Second Language I.*

51.848 Language in the English-Language Arts Curriculum
An examination of the multiple dimensions of language study in the English-language arts curriculum; the role of inquiry in the study of language and its implications for the English-language arts curriculum; theories of grammar and their relation to the study of language in the English-language arts curriculum; the inter-relatedness of language and the other components of the English-language arts curriculum. Each student will identify and investigate an area of individual interest. *Prep. 51.842, The English-Language Arts Curriculum or permission of instructor.*

51.849 Topics in English-Language Arts Education
An investigation of a matter of immediate concern to English-language arts education, but for which no organized study is ordinarily available. Typical topics are: media in the English-language arts program; behavioral objectives in the English-language arts program; the English-language arts program for the disadvantaged. Each year the seminar topic for that year is announced prior to registration.

51.851 Seminar in Current Issues in the Social Studies
A content approach to problems of political, economic, and social significance which have contemporary relevance for teachers of the social sciences.

51.853 History and the Social Studies in the School Curriculum
Permits the student to explore some of the fundamental concepts of anthropology, sociology, economics, political science, and history. Emphasis will be given to the interrelatedness of disciplines and to the extraction of operating principles from those that aid in the analyses of social problems. As a consequence of such analysis, the student should be equipped to find a greater variety of conceptual relationships within the historical social science field. From there a framework for evolving courses of study can be generated. *Prep. teaching experience or certification.*

51.854 Social Science Materials Seminar
A curriculum course wherein the knowledge previously acquired will be used to establish criteria for the selection and development of curriculum materials. All materials of instruction will be viewed as means of implementation of objectives relating to specific social science concepts and skills. An effort will be made to personalize and concretize abstract phenomena and to demonstrate their impact on the quality of human lives. Students will examine and analyze prepared curricula and will be asked to develop original materials that include provision for the integration of a variety of thinking, reading, and social skills. *Prep. teaching experience or certification.*

51.861 Principles of Programmed Instruction
The development and current status of self-instructional devices. A survey of available programs and teaching machines, with emphasis on the details of the construction and evaluation of programs.

51.863 Methods and Materials for Teaching Children I
Teaching methods and learning materials used in teaching children in a number of educational settings. This course will help students establish objectives, plan and execute appropriate learning experiences, and evaluate outcomes. *Prep. must be taken concurrently with 51.800 Principles of Teaching.* Offered Fall Quarter only. (Open only to students in the Nondegree Certification Program.)

51.864 Methods and Materials for Teaching Children II
A continuation of 51.863. *Prep. 51.863 Methods and Materials for Teaching Children I; must be taken concurrently with 51.801 Curricula of American Schools.* Offered Winter Quarter only. (Open only to students in the Nondegree Certification Program.)

51.865 Methods and Materials for Teaching Adolescents and Adults I
Teaching methods and learning materials used in teaching adolescents and adults in a number of educational settings and for a number of purposes. The course will help students identify objectives, plan and execute appropriate learning experiences, and evaluate outcomes. *Prep. must be taken concurrently with 51.800 Principles of Teaching.* Offered Fall Quarter only. (Open only to students in the Nondegree Certification Program.)

51.866 Methods and Materials for Teaching Adolescents and Adults II
A continuation of 51.865. *Prep. 51.865 Methods and Materials for Teaching Adolescents and Adults I; must be taken concurrently with 51.801 Curricula of American Schools.* Offered Winter Quarter only. (Open only to students in the Nondegree Certification Program.)

51.870 Developmental Reading and Writing
Reading and writing as the receiving and generating of language; current developmental reading, writing, and related language skills; selected research findings bearing on relevant topics. Required of candidates for Master of Education in Curriculum and Instruction: Reading Certification; Curriculum and Instruction: English; Curriculum and Instruction: Language Arts. *Prep. permission of instructor.*

51.871 Reading and Language Disabilities I
Reading and language disabilities; causes and correlates of disability; language differences; aspects of measurement; diagnostic and corrective procedures in reading, writing, and related language skills; selected research findings bearing on relevant topics. Required of candidates for Master of Education in Curriculum and Instruction: Reading Certification; Curriculum and Instruction: English; Curriculum and Instruction: Language Arts. *Prep. 51.870 Developmental Reading and Writing.*

51.872 Literature and Materials Seminar
Literature for children, adolescents and adults; the sources of interest in literature as they relate to the reader; the interrelatedness of literature and the other components of the language arts program; investigation of materials available. Students will develop projects related to their needs and interests. Required of candidates for Master of Education in Curriculum and Instruction: Reading Certification; Curriculum and Instruction: English; Curriculum and Instruction: Language Arts.

51.873 Reading Clinic I
Practicum in clinical experience. Children and adults with severe reading disabilities will be tutored in the Reading Clinic twice a week for 1¼ hours each session, under close staff supervision. A one-hour seminar will follow each tutoring session for purposes of discussion and case presentation. A diagnosis, lesson plans, daily logs, complete case history, and a final progress evaluation will be required of each student. May be taken concurrently with 51.871. *Prep. 51.870 Developmental Reading and Writing.*

51.874 Reading and Language Disabilities II
Second course in Reading and Language Disabilities, including an examination of selected models of language processes; cognitive and affective dimensions; problems in language pathology; and other learning disabilities including academic, perceptual-motor, and neurological areas. *Prep. 51.871 Reading and Language Disabilities I and 51.873 Reading Clinic I.*

51.875 Reading Clinic II
A continuation of the Practicum. Requirements and format will be the same as Clinic I. May be taken concurrently with 51.874. *Prep. 51.871 Reading and Language Disabilities I and 51.873 Reading Clinic I.*

51.876 Teaching Reading in Junior and Senior High School
Developmental or corrective reading programs at the secondary level. Development of reading rate, comprehension, interpretation, and study skills in the content areas.

51.877 Language and Reading
The following topics will be examined as applied to the reading process and the teaching of reading: characteristics and systems of natural languages; development of the English language; language acquisition and dialectology. Selected models of language processes will be examined in light of recent linguistic theory. *Prep. 51.871 Reading and Language Disabilities I.*

51.880 Evolution and Revolution in the School Curriculum
Examination of the curriculum of the American school as an expression of conflict between subject-centered and student-centered curricula, traditionalists and revisionists, behaviorism and psycho-dynamism, and the interplay of forces generated by students, teachers, administrators, and other interested groups. Present school curricula will be analyzed as the outcomes of such conflicts and trends for the future development of school curricula will be hypothesized. *Prep. experience or certification.*

51.881 The Dynamics of Curriculum Design
Identification and analysis of problems in curriculum and instruction in light of the forces affecting the curriculum within the student's area of specialization; design and implementation of solutions to such problems; evaluation and field-testing where feasible, of these solutions. *Prep. 51.880 Evolution and Revolution in the School Curriculum.*

51.882 Seminar: Ethnicity and Today's School Curriculum
Students will briefly review aspects of the history and culture of some ethnic groups to explore the unique manner in which certain universal needs are manifested. Prepared curricular materials, as well as authentic literary, visual, and artifact materials, will be analyzed, evaluated, and related to developed criteria, goals, and potential curricular impact in projecting the aforementioned cross-cultural needs or themes. Students will be asked to select, organize, and as necessary, develop independent materials and strategies, appropriate for classroom use. Efforts will be made to categorize developed units of work on various ethnic groups which appear to have significant parallel dimensions according to predetermined categories.

51.891 Thesis
A research activity that may be elected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

51.894 Workshop in Supervision of Instruction (6 quarter hours)
A workshop for teachers and other specialists in English, mathematics, science, social studies, and reading in schools and other educational institutions, which emphasizes the nature of the supervisory role and appropriate tasks for professional people overseeing the work of other professional people, at all levels of education. The workshop will focus upon the critical role of the relationship between supervisory functions and the quality of the performance and the needs for improvement of the individual being supervised. The supervising professional will be seen as a skilled, experienced, and sensitive person who can oversee the work of others as well as understand a great deal about the curriculum and the specific content, skills, and understandings it embraces, and how to communicate these to students. Will include a weekly seminar dealing with matters of a generic nature concerning the nature of supervision at all levels and within the total curriculum of schools or other educational programs and small group seminars. Participants may consider the problems related to more specific content areas and levels, and supervised field work.

51.895 Institute in Elementary Education
(See general Institute description on page 122.)

51.896 Institute in Secondary Education
(See general institute description on page 122.)

51.897 Workshop in Elementary Education
(See general workshop description on page 123.)

51.898 Workshop in Secondary Education
(See general workshop description on page 123.)

51.899 Directed Study
This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the Department. *Prep. approval of the Chairperson of the Department and of the Director of the Graduate School of Education. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)*

51.900 Cooperative Education in America
An examination of cooperative education as a complex tool for achieving goals of education. Attention will be directed to its psychological implications for the individual, its social implications for the nation, and its place in educational thought. American higher education will be the principal focus of these considerations.

51.920 Methods and Materials in Adult Literacy Education
This introductory course includes a review of current ABE programs around the country with particular emphasis on the programs in Boston, e.g., OIC (Opportunities Industrialization Center), New Urban League, WIN (Work Incentive Program), and public school programs for adults. This review of the programs will include a study

and some observation of ongoing programs in the area, especially the WIN program presently being run by the University. Specifically, students will discuss, observe, and study various approaches to ABE programs in terms of curriculum, methodology, materials used, groupings, and evaluation.

A major objective of the course will be to become more aware of the psychological problems of adult readers and nonreaders. Adult behavior and learning will be studied; the effects on learning of particular environmental forces (e.g., black ghetto, Indian reservation, rural-urban factors, etc.); methods of teaching adults at various levels will be studied and observed, as will a wide range of currently available books and materials for adult programs. All students may do some supervised clinical work with adults in the Reading and Learning Clinic; logs will be kept on the diagnostic and corrective work developed for each student. *Prep. permission of instructor.*

EDUCATIONAL ADMINISTRATION

52.805 Simulated Problems: Secondary School Administration
The workshop is designed to place each student in a simulated decision-making situation as a principal or administrator of a secondary school. Background materials have been prepared which describe all aspects of a school system, including its publics, its policies, its certified and noncertified staff members, and its geographical and socio-economic makeup. These background data are disseminated through motion pictures, film strips, and taped interviews with influential people in the community, as well as through written materials. *Prep. 52.810, 52.811, or permission of instructor.*

52.806 Directed Field Experiences in the Administration of the Elementary School
Required of all master's candidates who major in school administration. Study and discussion of administrative functions will be coordinated with selected field trips to administrative settings and with guest lectures by practicing elementary school administrators. These experiences usually involve visits to such settings as: an elementary school, a middle school, a superintendent's office, a school committee meeting, and appropriate federal and state agencies. In addition, each student will be expected to participate in an administrative field experience in an elementary setting for a minimum of four hours per week. *Prep. 52.810 or permission of instructor.*

52.807 Directed Field Experiences in the Administration of the Secondary School
A companion course to 52.806; required of all master's candidates in school administration. Study and discussion of administrative functions will be coordinated with selected field trips to administrative settings and with guest lectures by practicing secondary school administrators. These experiences are aimed at educational agencies at the secondary level and will include visits to a comprehensive high school, a junior high school, a regional vocational-technical school, a superintendent's office, a school committee meeting, and appropriate federal and state agencies. In addition, each student will be required to participate in an administrative field experience in a secondary school for a minimum of four hours each week. *Prep. 52.810 or permission of instructor.* (52.807 may be a continuation of 52.806 or may precede it.)

52.808 Seminar in Educational Administration
A culminating experience for students majoring in school administration at the master's level. A student is confronted with major issues facing the school and its administrators. Great emphasis is placed upon applying knowledge gained in previous administrative courses to an understanding of contemporary education problems. *Prep. 52.810, 52.811, or permission of instructor.*

52.810 Leadership in Education, Part I
Part I of a two-term core course designed to introduce the student to concepts of formal organization. This core, consisting of a two-part sequence, is prerequisite to further study in the Department of Educational Administration. Part I provides the student with an overview of formal organizations as social systems, with emphasis given to the leadership function. Relationships between individuals and organizations are considered. Communications and decision-making functions are analyzed and examined.

52.811 Leadership in Education, Part II
Part II continues an emphasis on the leadership function in organizations. It examines selected informal organization elements such as motivation, normative order, social power, conflict, conformity, and creativity. Attention is given to processes of change and innovation in organizations. *Prep. 52.810 must be completed before enrollment in 52.811.*

52.813 Instructional Leadership: Curriculum Development and Supervision
Views the responsibilities of administrative personnel relating to the improvement of curricular and instructional practices. Evaluative techniques, in-service education, supervisory procedures, and innovative programs are among the areas of consideration. Opportunities are extended for students to become engaged in supervisory projects individually or in small teams. *Prep. 52.810 and 52.811, or permission of instructor.*

52.814 Simulated Problems: Elementary School Administration
The workshop is designed to place each student in a simulated decision-making situation as a principal or administrator of an elementary school. Background materials have been prepared which describe all aspects of a school system, including its publics, its policies, its certified and noncertified staff members, and its geographical and socio-economic makeup. These background data are disseminated through motion pictures, film strips, and taped interviews with influential people in the community, as well as through written materials. *Prep. 52.810, 52.811, or permission of instructor.*

52.815 Simulated Problems: Administration of Occupational and Career Education
Each student is confronted with a series of simulated decision-making situations such as those which are usually faced by administrators of programs in the area of occupational and career education. Readings, audiovisual material, and class interactions constitute the design of this course.

52.816 Seminar in Career Education
Students will be confronted with a sampling of the major issues facing administrators and supervisors of occupational and career education programs in their efforts to organize, promote, and operate such programs. Emphasis will be placed on applying

the knowledge acquired in previous courses and other program experiences to arrive at an understanding of contemporary occupational and career education problems and their solutions.

52.817 Design, Production, and Utilization of Instructional Materials
Deals with all aspects of instructional media, surveying types, techniques, advantages, limitations, sources, and methods of use of materials and equipment in specified areas. Emphasis is on the selection of appropriate media to suit given learning objectives. Laboratory experience in operation of equipment and the production of instructional materials is provided.

52.818 Developing Curriculum Learning Packages
During this course each student will produce a self-correcting, self-pacing, self-directing learning package. Individualized programs currently using the concept of contract learning will be reviewed and evaluated.

52.819 Introduction to Instructional Television
Concerned with operation of an instructional television studio and the production of television programs for direct instruction. Each student will write, direct, and evaluate a short television program in any curriculum field and area of his choice.

52.820 Principles of Programmed Learning
Will cover the development and current status of self-instructional devices and programs. Students will survey available programs and teaching machines, with emphasis on details concerning construction, selection, evaluation, administration, and use of programs.

52.821 Administration of Instructional Media Programs
Addresses itself to the various aspects and problems involved in the management and operation of educational media programs Public school, university, medical center, commercial, and industrial training program settings are considered in terms of service, instruction, and research.

52.822 Foundations of Instructional Communications and Technology
Introduction to the concepts and principles of the learning process, communications, multimedia instruction and instructional systems. Surveys will include programmed instruction, instructional television, games and simulation, audiotutorial laboratories, computer-assisted instruction (CAI), computer-managed instruction (CMI), curriculum learning packages, mediated teaching units, individualized instruction, performance contracting, validated instruction, and criterion-referenced testing. Discussion will involve problems of administration and economics of instructional communications and technology in school systems and training centers.

52.823 Principles of Instructional Systems Development
Introduction to the concept of a system as it relates to the instructional process. Each student will select a problem in any area of his choice and conduct a complete systems analysis and systems synthesis to resolve the problem. The contributions of the behavioral sciences as they relate to systems development will also be reviewed.

52.824 Administration of Cooperative Education
An examination of significant elements in the planning, implementation, and operation of a cooperative education program. Areas of concern include: agents for in-

stitutional change, intra-institutional relationships, program costs and funding sources, cooperative education calendars, development of cooperative work assignments, relationships with cooperative employers, and operational policies.

52.826 Administration of the Elementary School
A survey of the operational tasks performed by the elementary school administrator. Included will be: school-community relations, student personnel, staff personnel, curriculum and instruction, physical facilities, finance and business management, and organizational structure. *Prep. 52.810, 52.811, or permission of instructor.*

52.827 Administration of the Secondary School
A survey of the operational tasks performed by the secondary school administrator. Included will be: school-community relations, student personnel, staff personnel, curriculum and instruction, physical facilities, finance and business management, and organizational structure. *Prep. 52.810, 52.811, or permission of instructor.*

52.828 Administration of Early Childhood Education
This course will include the study of significant elements of administration unique to the planning, implementation, and operation of an early childhood education center. Areas of concern are funding sources, intra-institutional relationships, patterns for designing early childhood programs, on-site visitations, modes of private governance, use of plant, student and teacher placement, role of volunteers, and related topics. *Prep. 52.810 and 52.811.*

52.891 Thesis
A research activity that may be elected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

52.895 Institute in Educational Administration
(See general institute description on page 122.)

52.898 Workshop in Administration
(See general workshop description on page 123.)

52.899 Directed Study
This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the Department. *Prep. approval of the Chairperson of the Department and of the Director of the Graduate School of Education. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)*

CAGS AND DOCTORAL COURSE OFFERINGS IN EDUCATIONAL ADMINISTRATION

(Open only to CAGS and doctoral degree candidates or by special permission of the chairman of the Department, granted prior to registration.)

52.830 Current Issues in Educational Administration
A seminar required of all students pursuing the CAGS. Critical and contemporary issues which face school administrators will be examined closely. The status of the

administrator; federal, state, and local revenue sources; accountability; the voucher plan; teacher militancy; equal educational opportunity; conflicts with religious organizations; control of schools; urban education problems; cultural deprivation; and human rights are examples of topics that will be analyzed.

52.831 Innovation and Change in American Public Schools
A seminar required of all students pursuing the CAGS. Although major emphasis will be given to curriculum and instruction, attention will also be given to planned change in other critical areas such as team teaching, modular scheduling, nongradedness, educational parks, programmed instruction, in-service education, individualizing education, and teacher-learner relationships.

52.832 The Process of Administration
Simulation, case analysis, and role-playing will be utilized to gain insight into such topics as the improvement of organizational morale, professional job satisfaction, and current issues of involvement and conflict. Alternative courses of action are studied to cope with problematical events confronting educational administrators.

52.834 Educational Finance
The study of school finance deals with the principles and problems of financing education, and also considers the basic concepts of economics relative to the place of school finance in the field of public finance. The sources and rationale for public support of schools are examined. Selected state and federal aid programs, capital outlay programs, current practices and issues of local support, and bond issue campaigns are included in this study.

52.835 School Business Management
Practices and issues in the administration of school business affairs are the major concern of the course. The role of the school business administrator and the educational budget will be examined. Attention will be paid to principles of budget preparation and development, purchasing, supply management and distribution, school accounting and data processing systems, auditing, financial reporting and management of payroll, transportation programs, school food services, and the operation and maintenance programs for the physical plants. In addition, each student will be placed in a simulated decision-making situation. Background materials have been prepared which describe aspects of a fictitious school system, including its publics, policies, and other relevant information. Each student will have the opportunity to deal with matters typically faced by the school business administrator.

52.836 Personnel Administration
The purposes, patterns, and issues in personnel administration are the major considerations of the course. Study will include the skills, attitudes, and knowledge which an institutional staff needs to have and which are essential to the accomplishments of organizational goals. Personnel administration programs and problems of student personnel, para-professional, nonprofessional, and professional staff members will serve as the focus for the course.

52.837 School-Community Relations
This course includes the study and design of school-community relations programs based on the principles and practices of the intercommunications between the school and its several publics. Selected research findings relative to public relations

programs in business, industry, and governmental agencies will be reviewed in addition to those involving educational systems. Stress will be placed on the role of the administrator in the development of a comprehensive program of school-community relations for his administrative unit.

52.838 School Plant Planning, Operation, and Maintenance
This course seeks to have the student develop a basic understanding of the processes involved in the planning, maintenance, and operation of school plants. Such items as educational specifications, the process of school construction, techniques used to provide clean, safe, and healthy environments for the teaching-learning process, along with the selection, assignment and supervision of custodial and maintenance staff will be involved. Statutes or regulations pertaining to these processes used by state and local regulatory bodies will also be reviewed.

52.840 Problems in School Administration: A Simulated Experience — The Superintendency

52.842 Problems in School Administration: A Simulated Experience — Assistant Superintendent for Instructional Services
These courses are designed to place each student in a simulated decision-making situation in his area of concentration. Background materials have been prepared which describe all aspects of a school system, including its publics, policies, certified and noncertified staff members, and the geographical and socio-economic makeup of the community. These background data are disseminated through motion pictures, film strips, and taped interviews with influential people in this community as well as through written materials.

52.843 Administrative Internship
This is an individualized offering involving supervised observations, internships, externships, and seminars in educational administration, and it is designed to provide further practical experience in the student's area of administrative preparation. The administrative internship program must be worked out well in advance with the adviser.

52.844 School Law
The student will be expected to develop a basic understanding of federal and state laws that apply to school systems, educational programs, and personnel, as well as of the legal prerogatives available to the practicing administrator and the local boards of education. This study will include consideration of the constitutional, statutory, and common-law foundations of educational systems and the school administrator's role with respect to them.

52.845 Seminar in Media Research and Learning
Provides for surveys, critical analyses, and discussions of current research dealing with learning principles, communication theory, media, and instructional systems design. Oral and written reports are required. Experimental and field research are considered for additional credit in subsequent terms.

52.846 Developing Curriculum in Learning Packages — Advanced
Using the instructional development techniques acquired in the introductory course,

students will design a more sophisticated learning package, field test it, and using the test data, revise the package until the predetermined criteria are met.

52.847 Cataloguing and Classification of Instructional Materials
The principles, codes, and techniques utilized in organizing both print and nonprint materials in an integrated collection. Emphasis on the application of bibliographic methods of control to films, records, slides, cassettes, kits, and other media. Acquaintance with the sources and tools listing instructional materials for the purpose of ordering them, and the development of the skill which assists the user in locating them.

52.850—851—852 Doctoral Seminar in Leadership: Administration and Supervision I, II, III
A series of three seminars required of all students pursuing the Ed.D. degree. The dialogues in these courses will use an interdisciplinary approach to explore complex behavioral and structural interactions found in formal organizations. Major emphasis will be placed upon integrating theoretical concerns with practical administrative functioning.

This sequence of seminars is viewed primarily as a pooling of the results of extensive individual student research and activities and is aimed at giving the student an overview of all aspects of the institution he will be leading.

52.854 Organizational Analysis
A course open only to students pursuing the Ed.D. degree, this course will include examination of different approaches used to define traits or characteristics of formal organization. Special emphasis will be placed on the application of models, typologies, and schemes to identify structural or procedural deficiencies in bureaucratic social systems.

52.860 Academic Administration in Higher Education
Recruitment of properly qualified faculty and staff is only one problem of the academic administrator. This course will also consider the problems of: pupil services, admissions, athletics, curriculum development, accreditation, instructional resources, registration and scheduling, faculty organization, continuing education, faculty rights and responsibilities, and personnel policies.

52.861 Problems in College Administration: A Simulated Experience
This seminar is designed to place each student in simulated decision-making situations as an administrator of a college or junior college. Background materials have been prepared which describe all aspects of a college including its policies, makeup of faculty and student body, its financial situation, the community it serves, and its board of control. These data are disseminated through motion pictures, film strips, and taped interviews as well as through written materials.

52.862 Institutional Planning and Facilities
This course will consider the planning of new colleges as well as the expansion and maintenance of existing ones. Systems analysis, needs surveys, and development of educational specifications for college facilities will constitute half of the course. The other half will involve the operation and maintenance of the physical plant, including provisions for housing, safety, parking, communications, and health service.

52.863 Financial Management in Higher Education
This course seeks to combine a knowledge of fundraising activities with the study of proper financial management in higher educational institutions. The problems of fundraising for both public and private, two- and four-year institutions will be considered. Modern techniques of budget preparation and control will include purchasing, school accounting, data processing, providing benefits for faculty, financial reporting, food services, housing, and operation and maintenance of physical plant.

52.864 Typologies of Higher Education
A study of the types of higher educational institutions, with emphasis on organizational structure, modes of governance, and administration. The history of higher education, particularly the development of colleges, universities, and junior colleges in the United States, will be considered to provide perspective for the modern college administrator. Important issues and the problems they presented for adminstrators will provide the major focus of this course.

52.865 Systems Theory in Education
This course will provide the student with an introduction to general systems theory and the implication of systems theory to leadership, administration, and supervision. The course will include examination of systems applications such as PERT, PPBS, and flowchart development. Special consideration will be given to systems study as a method of planning and evaluation.

52.866 Politics and Educational Decision Making
This course examines federal, state, and local governmental arrangements and political processes which influence educational policies of school systems. Emphasis is given to the application of political science concepts and research methods to educational policy-making processes and to the political environment surrounding the educational administrator.

52.867 Administration of Adult and Continuing Education
The historical development of adult and part-time education, with attention to the present status and trends for the future, will be studied, with emphasis on the administration of these programs. A variety of adult educational programs in schools, colleges, junior colleges, religious agencies, social service organizations, business and industry, and professional organizations will be included, focusing on planning, implementing, administering, financing, and evaluating such programs.

52.868 The Community College
Emergence of the community college movement in the United States; administrative structures and governance; the role of faculty in planning. The student population and related student personnel services will be examined. Particular emphasis is placed upon the identification and utilization of community resources in curriculum development and the college's total relationships with the community in which it exists. The two-year technical institute and both publicly and privately supported junior colleges will be studied. Field visits are an integral part of course requirements.

52.893 Doctoral Dissertation
Prep. admission to candidacy in the Doctor of Education degree program.

52.899 Directed Study
This experience is provided for the student whose unique academic needs or in-

terests cannot be adequately satisfied in any of the scheduled courses of the Department. *Prep. approval of the Chairperson of the Department and of the Director of the Graduate School of Education. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)*

COUNSELOR EDUCATION

53.800 Philosophical Foundations of Guidance and Human Services
The purpose of this course is to provide a philosophical and theoretical background for beginning graduate students in counseling. The course has three objectives: 1) to sharpen the "self as instrument" through study and discussion of established theories of helping as related to one's personal value system and through self-exploration and increased self-understanding in heretofore unexplored personal areas; 2) to introduce students to the broad spectrum of professional helping service areas with the intent of clarifying the students' professional roles; and 3) to begin to promote the development of a professional identity as a psychological helping professional.

53.801 Tests and Test Procedures
The principles and problems of psychological testing as applied to the work of the counselor are discussed. Some consideration is given to technical concepts as they apply to the treatment, use, understanding, and interpretation of test scores. The student is made familiar with some of the currently used tests of intelligence, scholastic aptitude, differential aptitudes, achievement, interest, and personality. Tests are evaluated for use in education and guidance. Problems of test interpretation are emphasized.

53.802 Vocational Development and Occupational Information
A dual-emphasis course dealing, first, with theories about how individuals make decisions concerning their choice of vocation, and second, with the kind of data which is needed to assist people with these decisions. This requisite data deals with the following areas: the relationship of social and economic change to occupational trends; the classification and description of occupational fields; methods of collecting, evaluating, filing, and disseminating vocational information; and the role of the counselor in fulfilling these functions.

53.804 Counseling Theory and Process
A required course for all Counselor Education degree candidates which must be taken in the Fall Quarter concurrently with the beginning of Practicum. The course will provide the student, through self-instructional materials, with a basic cognitive understanding of several major theoretical approaches to counseling. Classroom content will help the student to become familiar with a wide range of individual counseling strategies; to develop listening, understanding, and communications skills; and to further probe his own self-understanding as a counselor. These skills and understandings will be discussed and simulated in the context of a variety of settings with a variety of clients. Role playing, case material, and audio and video materials will be utilized in the instruction. This course will not be open to special students, but may be elected by degree candidates in other departments in any quarter except the fall quarter.

53.805—806 Counseling Practicum I and II
The counseling practicum is a supervised counseling experience extending over the

academic year. Although registration for this course occurs only during the Winter and Spring Quarters, students will actually begin their practicum in the Fall Quarter. Emphasis in the fall will be on small-group seminars dealing with counseling and other related matters. The Winter and Spring quarters will concentrate on the supervised counseling assignment. Assignment to practicum settings will be made according to the student's major area of concentration. Students must make themselves available a minimum of two days per week during the academic year (October to June) for placement in a field setting. Seminars will stress material germane to the student's major and will meet a total of 24 times during the year. (For administrative purposes, these practicum course numbers will apply to each of the following specific practicum placements: Elementary School Practicum, Secondary School Practicum, College, Mental Health and Rehabilitation Practicums.)

Part-time students must submit an application for practicum (available from the Department) by April 1, for approval to enroll in the practicum the following Fall Quarter. *Prep. 53.800 Philosophical Foundations of Guidance and Human Services and 53.804 Counseling Theory and Process, both of which may be taken concurrently with the beginning of practicum.*

53.807 Administration of Guidance Services
An advanced-level guidance course designed to help meet the certification requirements for guidance directors in Massachusetts. The course will cover philosophies, principles, and methods of establishing and administering guidance programs in the public schools. Simulated materials are used to replicate actual guidance problems dealing with testing programs, budgeting, interpersonal relationships, and other practical matters.

53.808 Group Counseling
An introduction to theory, principles, and techniques of counseling with groups of individuals at different levels of development and for varying purposes. A basic mode of approach will be to involve students in a genuine group counseling experience in order to understand the phenomenon of group experience. *Prep. 53.804 Counseling Theory and Process or permission of instructor.*

53.809 The College Student and the Campus
The relationship between college students and their environment will be examined. Focus is on student rights, emotional concerns, and the search for identity. The impact of societal forces and nontraditional patterns of study on student behavior are stressed. Varying concerns of personnel services in different types of college climates, including the community college, are discussed. Current issues in higher education are examined as they relate to services to students.

53.810 Elementary School Guidance
Required for elementary counseling majors, this course has three principal objectives: 1) to gain a theoretical understanding of the personal, social, academic, and vocational development of children between the ages of 5 and 12 years; 2) to conceptualize the roles, functions, and goals of the elementary school counselor; and 3) to begin to consider a variety of programmatic strategies to operationalize the goals of the elementary school counselor. Topics to be studied include values clarification, decision making, developmental guidance, major theoretical approaches to development, the issue of exceptionality, occupational information and vocational development, and confluent education. These topics are set in the context of the elementary school counselor's role as a counselor/consultant/coordinator for the total elementary school population.

53.811 Family and Parent Counseling
The family will be studied as an institution, as an arena of interpersonal transaction, and as a seedbed of both distress and health. Various modes of counseling families will be presented, together with the theoretical notions underlying their use. The course will also demonstrate counselor-parent relations in the context of the school setting. *Prep. 53.804 Counseling Theory and Process or permission of instructor.*

53.812 Seminar in Student Personnel Work
Relevant topics and cases for personnel workers and administrators in higher education will be discussed and studied in depth. Particular emphasis is placed upon the development of student personnel programs, budget planning and development, and staff relationships. The expertise of appropriate specialists is utilized.

53.813 School Counseling Strategies
Intended primarily for students who will counsel in school settings or other settings emphasizing work with children and adolescents. A broad range of approaches will be considered, including, but not limited to, behavior modification and Gestalt and Adlerian strategies. Special emphasis will be placed on the development of strategies designed to help alleviate typical school-related and developmental problems such as nonachievement, decision making, negative self-identity, and disruptive behavior. Consideration will also be given to the counselor's role as a consultant to teachers, parents, and administrators in effecting positive behavior change. *Prep. 53.804 Counseling Theory and Process.*

53.814 Vocational Counseling Strategies
Develops an understanding of the essential ingredients of a self-awareness program especially in relation to a person's role expectations in the world of work. Vocational counseling is viewed as dealing with the entire individual, including his values, underlying psychological needs and drives, and the influence of the environment on one's present level of development and career awareness. Other topics to be developed in this course will include counseling with females and nonachievers, the decline of the work ethic, community resource development, job placement, and information giving as a perceptual process. *Prep. 53.804 Counseling Theory and Process. The course is intended for a variety of client populations from adolescence through adulthood.*

53.815 Rehabilitation Counseling Strategies
Primary emphasis will be on the roles and functions of the rehabilitation counselor, relevant issues in the field, and an overview of the rehabilitation process. Special problems and techniques of counseling with the disabled (physical, mental, and behavioral disorders) will be examined through case studies and role playing. Disability in the context of social deviance will be discussed, and psycho-social approaches in understanding human behavior, including self-concept, social role theories, and rational-behavioral approaches, will also be examined. *Prep. 53.804 Counseling Theory and Process (This prerequisite is waived for Rehabilitation Administration majors.)*

53.816 Psychological Counseling Strategies
Focuses on a variety of strategies designed to alleviate problems of older adolescents and adults. Perceptual-Gestalt insight approaches and behavioral approaches to counseling will be analyzed for their effectiveness with a variety of psy-

chological problems. The context for considering this eclectic approach to psychological counseling will be communications theory and organizational psychology, with the latter being related to the effective delivery of counseling and mental health services. *Prep. 53.804 Counseling Theory and Process. This course is primarily intended for the student working with client populations in mental health settings and college counseling centers.*

53.818 Case Studies in Marriage and Family Counseling
An advanced-level course for students with previous experience or preparation in marriage and family counseling. Skills to be emphasized will include 1) the preparation of case studies of family and marriage histories and current functioning; 2) the design of service, counseling, and referral programs based upon comprehensive studies of needs and resources; and 3) the practice of counseling strategies through role playing, taped interviews, and progress reports of current counseling activities. *Prep. 53.811 Family and Parent Counseling.*

53.820 Seminar in School Psychology
This course provides an intensive analysis of philosophical, technical, and school administrative issues contributing to the professional identity and function of the psychologist in an educational milieu. Simulations, case studies, and research projects will be used to study these issues. *Prep. permission of instructor.*

53.821 Psycho-Educational Prescriptions
This course will deal with methods of synthesizing psychological information into effective, individually appropriate educational plans. Specific applications of methods from previous courses will be discussed. *Prep. permission of instructor.*

53.824 Individual Intelligence Testing (6 quarter hours)
Preparation to administer, score, and interpret the Stanford-Binet Intelligence Test, the Wechsler Adult Intelligence Test, and the Wechsler Intelligence Scale for Children. Consideration will be given to the theories of intelligence upon which the tests are based and the use of the tests in educational and clinic settings. Students will be required to administer and score thirty tests, including some from each of the three tests included in the course. *Prep. 53.801 Tests and Test Procedures or permission of instructor.*

53.830 Seminar in Contemporary Issues in Counseling
Intensive study of a selected topic in counseling such as counseling minorities, current research, sex counseling, transactional analysis theory and practice, behavioral counseling. Course objectives will vary according to the topic but may include a review of the literature, skill-building workshop and action projects. *Prep. 53.834, Advanced Theories of Behavior Change and/or permission of instructor.*

53.831 Advanced Group Counseling
This course will be a continuation of the content presented in Group Counseling, placing greater emphasis on developing skill in conducting group counseling at a variety of age levels. Greater attention will be given to relevant readings and research on group process and methods for behavior modification. *Prep. 53.808 Group Counseling.*

53.833 Seminar in Counseling Supervision and In-Service Education
Supervisory methods of improving the effectiveness of school counselors' skills in

counseling and other aspects of guidance work, of involving counselors in the improvement of the guidance program, and of enhancing the personal growth of the counselor. *Prep. master's degree in guidance or permission of the instructor.*

53.834 Advanced Theories of Behavior Change
An advanced-level counseling course required of all CAGS students and designed to provide greater depth of cognitive understanding of a variety of approaches to counseling. Original readings from a number of major theorists will be required. A major goal of the course will be to identify the major similarities and differences of assumptions, goals, and strategies of the theorists studied, and to build a strong conceptual basis for a counseling eclecticism from this analysis. Some of the theorists studied will include Freud, Adler, Perls, Ellis, Glasser, Rogers, Sullivan, May, Frankl, Bandura, and Skinner. *Prep. at least two counseling courses emphasizing both theory and process.*

53.835 Psychodiagnostic Measures
An advanced-level course in the use and interpretation of interest and personality measures for more clinically-oriented settings. The course will place heavy emphasis on the case study method. Some of the tests typically studied in this course may include the Minnesota Multiphasic Personality Inventory, the California Psychological Inventory, Edwards Personal Preference Schedule, the Semantic Differential, and various interest measures. The course will introduce the student to projective techniques, beginning with the sentence completion test. *Prep. 53.801 Tests and Test Procedures, Abnormal Psychology or Personality Theory, and permission of instructor.*

53.840—841 Advanced Field Work (8 quarter hours)
Required of all CAGS students. The student will be assigned a field work placement consistent with his major professional goal and/or the setting in which he intends to work. The activity of the field work will extend across the academic year from September to June and require a minimum of one and a half days per week, or the equivalent, in the field work setting. Seminars will meet on alternate weeks with additional individual supervision on campus. Supervision will also be provided in the field setting. Both quarters must be completed before credit will be given for the course. *Prep. Counseling Practicum or the equivalent in experience.*

53.843—844 School Psychology Field Work (8 quarter hours)
Required of all CAGS School Psychology majors. The student will be assigned a field work placement in a K-12 school system under the supervision of a certified school psychologist. The activity of the field work will extend across the academic year from September until June. The student will be required to put in a minimum of one and a half days (300 hours) in the field work setting during the school year. Seminars will meet regularly on campus with additional university faculty supervision. *Prep. School Psychology Practicum.*

53.891 Thesis
A research activity that may be elected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

53.893 Doctoral Dissertation
Prep. admission to candidacy in the Doctor of Education degree program.

53.895 Institute in Counselor Education
(See general institute description on page 122.)

53.898 Workshop in Counselor Education
(See general workshop description on page 123.)

53.899 Directed Study
This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the Department. *Prep. approval of the Chairperson of the Department and of the Director of the Graduate School of Education. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)*

SPEECH PATHOLOGY AND AUDIOLOGY

55.803 Cerebral Palsy
Neuromuscular involvements and concomitant language and speech disorders; intellectual deficits, psychological deviations, communicative disorders of a cerebral palsied population; testing, placement, and management of the cerebral palsied child and adult with emphasis on a multidisciplinary approach. *Prep. permission of instructor.*

55.804 Aphasia
The neurological terminology related to the processing of language; neurological communication model, communication modalities and what resultant effects occur from lesions; the relationship between linguistics and psycholinguistics. Analysis of language of an aphasic patient. *Prep. permission of instructor.*

55.805 Seminar: Voice Disorders
Physiology and neurology of the laryngeal mechanism; the laryngoscopic examination. Voice disorders as learned behavior as a result of organic, neurological, and psychological deviation. Evaluation, referral, and management. *Prep. permission of instructor.*

55.806 Language Disturbances in Children
This course will emphasize current theories in language behavior and their practical application to the assessment and remediation of language disturbances in children. Lectures, discussions, and workshops will focus on the following issues: what constitutes a language problem, what assessment tools and teaching techniques are currently available, and what underlying principles are involved in selecting and sequencing the content of a remediation program. *Prep. 55.812 Differential Diagnosis in Speech and Language Pathology and 55.816 Test Procedures in Speech and Language Pathology or permission of instructor.*

55.811 Clinical Management in Stuttering
This course will emphasize diagnostic techniques, a review of the current therapeutic approaches, consideration of the individual's need in therapy, and the process of behavioral and attitudinal change. Also to be considered are termination, referral, and group therapy. *Prep. permission of instructor.*

55.812 Differential Diagnosis in Speech and Language Pathology
Evaluation, interpretation, and integration of test results; the application of standard

psychological tests to speech and hearing disorders; analysis of patients' premorbid and morbid histories, medical and psychological diagnoses; design and execution of therapeutic procedures; proper referral techniques and report writing; practicum situation. *Prep. 55.816 Test Procedures in Speech and Language or permission of instructor.*

55.813 Advanced Clinical Practice (8 quarter hours)
Supervised clinical practicum in speech pathology and audiology in the Northeastern University Speech and Hearing Clinic and medical settings, educational settings, and rehabilitation centers. A minimum of 150 clock hours of experience with patients to extend over a three-quarter time period is required. An "I" grade will be awarded until all the requirements are met and then a pass-fail grade will be awarded. This course requires attendance at on-campus seminar meetings held twice a month. *Prep. 50 clock hours of clinical experience and permission of the clinical staff.*

55.814 Clinical Audiometry I
The use of pure tone and speech reception instrumentation and hearing aid evaluation; the results and interpretation in the diagnosis of functional and organic disorders. Lectures, demonstration, observations, and practicum. *Prep. Introduction to Audiology and consent of instructor.*

55.815 Clinical Audiology
The process of identification and evaluation of hearing loss. Differential diagnosis. Tests for conductive, sensorineural, and retrocochlear involvements. A consideration of research findings in the area of hearing aid selection, auditory training, lip reading, and language training for hearing handicapped individuals. *Prep. Introduction to Audiology (see undergraduate Education catalog) and permission of instructor.*

55.816 Test Procedures in Speech and Language Pathology
Procedures in evaluating organic and functional communication disorders using standard and nonstandard speech and language tests in University clinic situations. Demonstration and application of techniques and objective reporting. *Prep. permission of instructor.*

55.817 Advanced Anatomy, Neurology, and Physiology of Speech-Hearing Mechanism
Lectures and demonstrations by medical personnel. Emphasis on the head and neck. Admission by consent of adviser and medical supervisor. For advanced standing students. *Prep. Anatomy, Neurology, and Physiology of Speech and Hearing I; Introduction to Audiology; Pathlogies of the Ear and permission of instructor.*

55.818 Pathologies of the Ear
Lectures and observations in the organic and neurological pathologies of the ear; i.e., otitis media, Meniere's disease, and otosclerosis. Consideration of approaches to treatment (medical setting). *Prep. permission of instructor.*

55.819 Clinical Audiometry II
Specialized techniques (Bekesy, FGSR, EEG, group testing, and screening); the results and interpretation in the diagnosis of functional and organic hearing disorders. *Prep. Introduction to Audiology and Audiometry I, lectures, demonstration, observations, and practicum; permission of instructor.*

55.820 Physiological Acoustics
Particular emphasis is placed on the biophysics of the hearing mechanism, especially in terms of actual clinical utility. Comparative anatomy and physiological analysis and dissections will accompany many of the class lectures. *Prep. introductory courses in Speech and Hearing, 55.815 Clinical Audiology, and permission of instructor.*

55.821 Seminar in Audiology
Advanced study of the rationale and development of principles associated with special procedures and methods used in audiology. *Prep. permission of instructor.*

55.822 Seminar in Oro-Facial Anomalies
Course material will be presented via lectures, class discussions, and frequent visits to and participation in several plastic surgery clinics. Guest lecturers in the areas of plastic surgery, genetic counseling, and otolaryngology will be invited to participate in the course. Major content areas will be embryology, etiology, cleft lip and palate, and other syndrome classifications; speech and language considerations; surgical, dental, and otologic considerations; psychological and social considerations; and an analysis of the total team habilitative effort. *Prep. Anatomy and Physiology of the Speech Mechanism and permission of instructor.*

55.823 Psycho-Social Aspects of Communication Disorders
This course is concerned with the psychological and social aspects of organic and nonorganic communication disorders. It will include personality dynamics in aphasia, cleft palate, cerebral palsy, deafness, and other primarily organic disorders, and psychogenically motivated disorders such as stuttering, language, and articulation. *Prep. permission of instructor.*

55.824 Seminar in Speech Pathology
Individual research and/or critical review of the literature in some area of basic science, speech sound learning, language, voice, fluency, or multiple disorders. Class presentations of material and class discussion will be included. *Prep. open to graduate students who have completed the equivalent of two quarters of graduate work in Speech Pathology and who have permission of the instructor.*

55.860 Aphasia Rehabilitation
Emphasis on current attitudes toward therapy and new methods, clinical methods of evaluation which are preparatory to therapy, and observation of therapeutic methods. *Prep. 55.804 Aphasia and permission of instructor.*

55.861 Neuropathology
The intricacies of neurological disease. Application of functional neuroanatomy in comprehending the various disease processes involving the nervous system. Derangements of speech with a neurological basis; an understanding of the disease process in relation to the diagnosis and treatment of patients with neurological diseases: cerebrovascular disease tumors or malformations, Parkinson's disease, multiple sclerosis, and others. Case presentations, neuroanatomy, laboratory experience, and analysis in the hospital environment. *Prep. permission of instructor.*

55.862 Psycho-Acoustics
Particular emphasis will be placed on masking, frequency vs. intensity relationships, evoked response procedures, brieftone and temporal integration, binaural summa-

tion, impedance foundations, and general behavioral responses to sound stimuli. *Prep. Introduction to Speech and Hearing, 55.815 Clinical Audiology, 55.820 Physiological Acoustics, and permission of instructor.*

55.863 Advanced Study in Articulation Disorders
An exploration into advanced theories of normal and abnormal phonological development with emphasis on distinctive feature theory and phoneme theory; direct application of theories to diagnosis and treatment of various phonological disorders. *Prep. undergraduate course in articulation disorders and permission of instructor.*

55.864 Parent Education in Communication Disorders
This course is designed to develop the student's understanding of the role of the parent in the therapeutic process. Content of the course includes various approaches to parent education, including group therapy, client-centered counseling, and filial therapy. *Prep. 55.823 Psycho-Social Aspects of Communication Disorders and permission of instructor.*

55.865 Seminar: Speech Science
Major topics will include the physics of sound generation and modification via the vocal tract, the biophysiology of respiration for phonatory processes, electromyographic techniques and biopotential recording systems, laryngeal and articulatory function, coupling, nasality, and X-ray procedures (head plate analysis). Neural innervation and vascular supply will be considered in conjunction with each muscle discussed. *Prep. course in speech science, 55.817 Advanced Anatomy, and permission of instructor.*

55.866 Hearing Science Seminar
Individual research and/or critical review of the literature in the areas of bone conduction of auditory signals, evoked response and audiometry, impedance and audiometry, cortical processing of auditory input, and other related topics. Students will be responsible for class presentations of researched material. *Prep. permission of instructor.*

55.891 Thesis
A research activity that may be elected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

55.895 Institute in Speech Pathology and Audiology
(See general institute description on page 122.)

55.898 Workshop in Speech Pathology and Audiology
(See general workshop description on page 123.)

55.899 Directed Study
This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the Department. *Prep. approval of the Chairperson of the Department and of the Director of the Graduate School of Education. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)*

Teaching the Deaf

55.825 Teaching Speech to Deaf Children
Utilization of vibration, visual aids, kinesthetic and proprioceptive cues, residual hearing and imitation in combination, to elicit intelligible speech from the deaf.

55.826 Teaching Language and Reading to Deaf Children
Modern methods in use, such as the Fitzgerald Key and the Natural Language Approach. Emphasis on how to use language in natural situations through lip reading and writing, with later emphasis on the formal presentation of language principles.

Methods used to develop reading experiences that focus on content rather than mechanics. Development of a balanced reading program that will provide adequate motivation, provision for evaluation, a wide variety of rich materials, and a well-organized sequence of reading experiences.

55.827 Methods and Materials in Deaf Education
Special methodologies in teaching the deaf. A wide view of the field and a comprehensive consideration of methods and materials. Emphasis placed on how to provide concrete experiences and activities, trips, and demonstrations to assist the child in understanding. There will also be demonstrations in the use of visual and auditory aids.

55.828 Aural Rehabilitation
Various speechreading methods, auditory training techniques, and materials. An integrated approach to the treatment of the hearing handicapped.

55.852 Practicum: Teaching of the Deaf (8 quarter hours)
An opportunity for observing and teaching deaf children at various levels, under regular supervision in the Beverly School for the Deaf.

REHABILITATION ADMINISTRATION AND SPECIAL EDUCATION

Rehabilitation Administration

56.950 Introduction to Rehabilitation
An overview of and orientation to the field of rehabilitation, including its historical development, legislative involvement, psychological implications, and sociological dimensions. Emphasis is placed on coordinating and integrating services as they relate to the field of rehabilitation as a community process.

56.951 Principles of Medical Rehabilitation
The wide spectrum of disabilities that could profit from rehabilitation, including orthopedic, neurological, medical, surgical, and mental disabilities. Basic principles of medical rehabilitation important for the administrator to know will be presented. Psychological aspects of disability will also be discussed.

56.952 Rehabilitation and Social Services
The use of vocational rehabilitation as an effective rehabilitation process in federal, state, and private agencies as supported and encouraged by the most recent social and rehabilitation services legislation. This will include use of the rehabilitation model in programs for the physically handicapped, mentally retarded, emotionally disturbed, aging, welfare populations, youthful offenders, culturally disadvantaged, and

other special community programs. There will be emphasis on the administrative involvement in developing and supporting the diagnostic, evaluative, counseling, and placement procedures used in such rehabilitative programs.

56.953 Organization and Administrative Theory
The body of conceptual knowledge regarding organizational and administrative theory will be examined. Formal and informal organizations, organizations as social systems, status and role concepts, leadership in organizations, power structure, relationships to authority, decision making, and communication in and between organizations. An organizational analysis will be made of all the different types of rehabilitation settings currently in use.

56.956 Community Planning in Rehabilitation
What the administrator needs to know about community planning to plan a program in his area. Basic principles of community planning, community organization, and community dynamics, as well as interdisciplinary relations in rehabilitation. Examples of community planning from different rehabilitation agencies and the referral process among these agencies will be studied.

56.957 Federal-State Relations in Rehabilitation
The complex network of federal-state relations and their implications for rehabilitation. Grant procedures, matching formulas, public relations and VRA directives, state and federal legislation pertinent to rehabilitation.

56.958 Social Welfare and Rehabilitation
Acquainting rehabilitation administrators with the broad field of social welfare. The course will review the historical backgrounds of the relationship between vocational rehabilitation and social welfare and the more recent fast-moving developments in the relationship of these fields.

56.959 Rehabilitation Research
The emphasis in this course will be on administrative research, program evaluation, grantsmanship, etc. In addition, students will have the opportunity to develop a research design on some aspect of rehabilitation administration and carry out the necessary research operations involved.

56.960 Practicum in Rehabilitation Administration (8 quarter hours)
Students will be assigned to a variety of rehabilitation agencies for their practicum experience. Problem solving relevant to experiences encountered in internship. A seminar will be regularly conducted by a senior faculty member in conjunction with the practicum experience. This seminar will enable students to share their field work experiences and resolve problems in rehabilitation administration which are connected with their field placements. (Students are expected to be available one-half day in the Fall Quarter and two days in the Winter, Spring, and Summer Quarters.)

56.961 Rehabilitation Administration I
An in-depth study of management practices within a rehabilitation organization from a behavioral standpoint. Areas to be covered include need surveys, goal-setting practices, job descriptions, recruitment, staffing, training, professional development, caseload management, program planning, utilization of research, community relations, leadership patterns, performance appraisal, and external relationships. Special cases will be used in classroom exercises.

56.962 Administration of a Sheltered Workshop
Special problems of administering a sheltered workshop, such as community planning, work evaluation, job-training, labor relations, contracting, production, and occupational placement.

56.963 Rehabilitation Administration II
Understanding the fiscal management of the typical rehabilitation setting, including basic rehabilitation agency accounting, planned program budgeting, disbursements, cost-analysis, contracting, taxation, forecasting, and funding. The implication of data processing for fiscal management will be covered in the course. Special problems will be assigned during the course.

56.964 Rehabilitation and the Law
This course is designed to sensitize rehabilitation adminstrators to the impact of legislative developments upon the field of rehabilitation. Special emphasis will be placed on understanding the legal implications for rehabilitation of the latest Vocational Rehabilitation Administrative Amendments, workmen's compensation laws, eligibility determination criteria, and Social Security Amendments.

56.965 Occupational Placement
A study of the dynamics of moving the rehabilitation client into the world of work within the framework of the specific community structure. Development of facility in use of resource materials in occupational information, job description and analysis, performance appraisal, training, and vocational assessment. The personnel point of view toward the handicapped will be discussed and analyzed, and more effective placement practices will be developed.

56.980 Psychological Problems of Disability
An advanced course in psycho-pathology as it relates to impact of disability on personality. In-depth study of the disabled, from the viewpoint of psychosocial factors, interpersonal relationships, and cognitive versus noncognitive functioning in those with motor and sensory disabilities; problems of dependency and motivation; role of psychosomatic factors.

56.981 Administrative Problems in Rehabilitation
Seminar designed to analyze, in depth, critical issues and selected rehabilitation problems. Operations and systems research as applied to rehabilitation will be highlighted. Students will make use of institute research studies and studies available through Social and Rehabilitation Services, completed research, and demonstration projects.

56.982 Essentials of Case Management and Supervision
The relationship between case management and casework supervision will be explored. Topics covered will be dynamics of the communication process, decision making, conflict, resolution and compliance, management of resources external to the organization, and structural and functional analysis of supervisory process. Management of case load.

56.983 Rehabilitation of the Alcoholic and Drug Dependent
A study of comprehensive factors, including the nature of etiology dynamics involved in alcoholic and drug dependency; techniques for evaluation; rehabilitation administration, planning, and treatment.

56.984 Rehabilitation of the Penal Offender
The rehabilitation of the penal offender will be examined from an eclectic point of view. Psychodynamic elements will be stressed, as well as social factors in the etiology, evaluation, treatment and rehabilitation seminar planning and administration.

56.985 Rehabilitation of the Geriatric
This course will present a comprehensive treatment of the problems, dimensions, and parameters involved in the administration of the various services and facilities for the rehabilitation of the geriatric. Special emphasis will be placed on the rehabilitation philosophy versus disengagement.

56.986 Critical Issues in Rehabilitation Administration
This course will be built around the exploration and in-depth discussion of current issues which are highly problematical to the field. Among these issues are the breadth of the concept of disability, appropriate training sequences for the various rehabilitation disciplines, the resolution of conflict over role overlap among disciplines, appropriate models for service delivery systems, etc. The most current and relevant research will be brought to bear upon these areas, as well as knowledge from the reservoir of experience of instructors, visiting experts, and the student participants themselves. Students will be prepared to cope with these issues as they exist in the profession and in the community. A theoretical orientation frame of reference will be brought to bear upon problems wherever feasible.

56.991 Thesis
A research activity that may be elected by the student in lieu of two electives (8 quarter hours), with the approval and recommendation of the adviser.

56.993 Doctoral Dissertation
Prep. admission to candidacy in the Doctor of Education degree program.

56.995 Institute in Rehabilitation Administration
(See general institute description on page 122.)

56.998 Workshop in Rehabilitation Administration
(See general workshop description on page 123.)

56.999 Directed Study
This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the Department. *Prep. approval of the Chairperson of the Department and of the Director of the Graduate School of Education. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)*

Special Education

(For sequence requirements refer to Fields of Study)

56.801 Alternatives for Providing Services for Special Needs Children
A course for those involved in the regular classroom, special education, pupil personnel, and administration. Models will be provided for decision making and program evaluation with reference to appropriate research. The consultative role of

the special educator will be defined and developed. There will be interaction with members of varied and allied disciplines who provide services for special needs children.

56.807 Learning Disabilities
This course surveys behavioral characteristics of children who present specific deficits in perceptual, integrative, or expressive processes which impair learning efficiency. Discussion of diagnostic techniques, curriculum materials, learning style and teaching methods will be combined with observation. Students will be expected to work with a learning disabled individual.

56.808 Current Methodology and Research in Learning Disabilities
This is an advanced course which will develop the following competencies in relation to learning disabled individuals from early childhood through adulthood: use of task analysis and learning style to develop comprehensive individual education plans (refinement of skills developed in 56.807); use of current research to evaluate techniques of intervention (e.g., behavior modification and drug therapy for hyperactive children); use of current research to evaluate assessment techniques (e.g., effectiveness of available tests for learning disabilities); ability to administer, score, and interpret tests useful in identifying learning disabilities; use of prescriptive techniques and materials for learning disabilities. Selection of topics within competency areas will be individualized for students based on previous course work and experience. *Prep. 56.807 Learning Disabilities and 50.815 Research Design in Education*

56.809 Development and Implementation of Programs for Learning Disorders
This advanced course develops required skills for resource room and diagnostic-prescriptive teaching personnel and consultation in the regular classroom. Projects for the course include some of the following: needs assessment for various special needs programs; development of a screening and diagnostic test battery; development of a diagnostic-prescriptive procedure for a specific population; development of in-service programs; development of a plan for educational group management. Projects will be selected by students according to their particular needs. Students in this course should be experienced in working with individuals with special needs. *Prep. 56.807 Learning Disabilities and 56.846-847 Special Needs: Measurement, Methods, Materials.*

56.831 Teaching the Emotionally Disturbed
A study of approaches used to deal with behavioral disorders. Emphasis will be on classroom management techniques, use of consultation, and parent-teacher interaction.

56.832 Group Dynamics
Emphasis on understanding group growth, behavior, and action fundamental to developing solutions to the complex problems of group life. Students will learn to examine their strengths and weaknesses, to make decisions, to become alert to new ideas and actions, to discover the pulse of a group, and analyze reasons for being productive while another group may be nonproductive. The group will examine such areas as sociodrama, sociometric techniques, attitude testing, social action project development, and communication blocks in human relations.

56.833 Mental Health
Study of conditions leading to optimal social adjustment. Consideration of the relationship between the maturation process and mental health, possible predeterminants of maladjustment, and factors which encourage the attainment of emotional maturity. Special emphasis will be paid to the role of the school. Contributions from the fields of psychiatry, psychology, sociology, physiology, and medicine will be synthesized and evaluated.

56.834 Case Conferences on Emotionally Disturbed Children
This course will be conducted as a seminar in connection with the student's practicum. Case presentations by outstanding resource persons will be thoroughly examined and discussed. Students will also be expected to make their case presentations to the seminar. *Prep. 50.807 Abnormal Psychology, 56.831 Teaching the Emotionally Disturbed.*

56.835 Socio- and Psychodynamics of Family Life
A consideration will be given to the internal and external dynamics of family life and the significance of such dynamics to the mental health of the handicapped child. Approaches to working with parents are explored. Emphasis will be on impact of disability on family functioning and integration.

56.837 Seminar: Problems of the Emotionally Disturbed Child
This course will be devoted to an intensive study of the special problems of the emotionally disturbed child. It will provide an opportunity to proceed in depth in areas of special interest to the seminar students. Special attention will be paid to problems presented by the autistic child, the neurotic child, the child with character disorders, the child with psychosomatic disorders, and the multi-handicapped child. *Prep. 56.880-881 Etiology and Development of Deviations in Special Needs Individuals.*

56.838 Development and Implementation of Programs for the Severely Handicapped
Course work will include observation of severely handicapped children in the classroom, demonstration of evaluation and assessment techniques, and development of educational plans for a severely handicapped child. *Prep. 56.840 Psychology of Mental Retardation and Other Handicapping Conditions, 56.846-847 Special Education Methods and Materials Related to Measurement and Evaluation (may be taken concurrently), 56.839 The Severely Handicapped.*

56.839 The Severely Handicapped
A review of handicapping conditions and consideration of the implications of severe multiple handicaps. Students will develop a case study of a severely handicapped person in conjunction with a review of relevant literature. *Prep. either 56.880 Etiology and Development of Deviations in Special Needs Individuals or 56.840 Psychology of Mental Retardation and Other Handicapping Conditions, or permission of the instructor.*

56.840 Psychology of Mental Retardation and Other Handicapping Conditions
A study of the social and emotional adjustment of handicapped children and of the psychological significance of mental, sensory, and motor variations in the adjustive process. The effects of limitations imposed by attitudes of society, the attitude of the

individual toward his handicap, and the effect of the handicap itself are evaluated. Implications for educational programs are analyzed. (This course should be among the first taken in the Special Education sequence.)

56.841 Development and Implementation of Programs for the Moderately Handicapped
Development and implementation of programs for the moderately handicapped will be discussed; classroom observation of moderately handicapped children, demonstration of evaluation and assessment techniques, and development of educational plans for one or more moderately handicapped children will be projects for the course. *Prep. 56.840 Psychology of Mental Retardation and Other Handicapping Conditions, 56.846-847 Special Education Methods and Materials Related to Measurement and Evaluation (may be taken concurrently).*

56.843 Evaluation and Education of the Vocationally Handicapped
Designed to develop fundamental skills in the evaluation and teaching of activities related to the vocational development of disabled individuals. Work sample and other techniques will be used to assess levels of skills. Focus will be on activities such as home management, use of tools, household repairs, basic sewing, essentials of food preparation, and activities of daily living (ADL). Visits will be made to sheltered workshops and vocational adjustment centers.

56.845 Rehabilitation and the Special Education Teacher
This course is designed to develop effective working relationships between rehabilitation professionals and special education teachers. Elementary and secondary school personnel concerned with children with special needs will also find the course pertinent. Consideration will be given to current legislation (Massachusetts Chapter 766) and its implementation, the teacher's role in rehabilitation, and understanding of the total rehabilitation process, and rehabilitation resources available to school personnel.

56.846 Special Needs: Measurement, Methods, and Materials I
Competencies will be developed in observation, recording, and analysis of children's behavior and learning environments including continuous measurement and informal assessment of mild and moderate special needs. Students will master strategies of applied behavior analysis including precision teaching and contingency management.

56.847 Special Needs: Measurement, Methods, and Materials II
Competencies will be developed in formal assessment techniques and in related instructional materials and methods in language arts, mathematics, and perceptual-motor skills. Students will be expected to work with individuals having mild to moderate special needs to develop the skills outlined above. *Prep. 56.807 Learning Disabilities and 56.846 Special Needs: Measurement, Methods and Materials I, or permission of instructor.*

56.848 Early Childhood Learning Problems — Identification and Program Development
Informal and formal screening and assessment procedures suitable for an early childhood population will be evaluated. Students will be required to work with young children in order to acquire experience with screening and assessment techniques.

The resulting information will then be used to develop programs to meet the needs of individual children. *Prep. 56.846 Special Education Methods and Materials or equivalent.*

56.849 Special Education for Gifted Children
Identification, characteristics, and problems of gifted, creative, and talented children and youth. Emphasis on administrative and instructional adjustments needed to provide for this group of exceptional children.

56.850 Field Work and Seminar with Special Needs Children
56.851 Student Teaching and Seminar with Special Needs Children
(4 quarter hours each)
Courses designed to satisfy present Massachusetts requirements for teaching children with special needs.

The courses extend over a full year in a series of experiences as observer, tutor, and teacher. Students must make available approximately 250 hours or two days per week for two quarters for field work, then approximately another 250 hours or four days per week for one quarter for student teaching. Students who are employed and who cannot devote full days to satisfy these requirements must arrange to be available evenings, weekends, and summers. Provision for attendance at biweekly seminars must also be made. Seminars are for the purpose of discussing with other students and professors issues in teaching special needs children, which arise in the field. Outside speakers and programs will be arranged to extend this dialogue.

Students who are certified, have a Letter of Approval, or are eligible for the latter from the Massachusetts State Department of Education as a Special Needs teacher may not be required to student teach. Student teaching in another area of special needs or an appropriate elective course may be substituted with the written approval of the student's academic adviser.

Approval of the academic adviser, in writing, will be required before the student can do field placement or student teaching. Approval, in writing, of the academic adviser will be required prior to obtaining a waiver of student teaching.

All students, regardless of past experience, certifications, or letters of approval, will do approximately 250 hours of field work set up and supervised by the University.

56.853 Field Work and Seminar
56.854 Practicum in Special Education (4 quarter hours each)
Courses designed to satisfy Department requirements for field experience and extended practicum for SECP or other students who do not need certification. The courses extend over a full year and cover a series of experiences. Students must make available a minimum of two days per week for the first two quarters and five full days per week for the third quarter. Application for field placement is made two quarters prior to that for which field work is planned. Part-time students who are employed will need to make provision for evening, weekend, or summer assignments to satisfy the requirement for field experience, and a full quarter of field work, five days per week. Provision for attendance at seminars must also be made.

56.870 Administration and Supervision of Special Education
Designed for advanced graduate students preparing for administrative or supervisory positions in special education programs. Facilities and curriculum adjustments, staff roles, methods and content for in-service training, and the use of the team approach are studied. Field trips to observe and evaluate programs are required. *Prep. 52.810, 52.811 Leadership in Education I & II.*

56.880-881 Etiology and Development of Deviations in Special Needs Individuals (8 quarter hours)
The first quarter (56.880) will concentrate on factors which primarily affect deviations in cognitive, motoric, and physical development. Understanding of these factors will be used to discuss multidisciplinary life-management issues relating to Down's Syndrome, cerebral palsy, and other common conditions.

The second quarter (56.881) will concentrate on factors which primarily affect emotional development. Psychobiological, psychodynamic, and learning theory approaches will be discussed and related to problems of life-span management. Community programs will be analyzed in addition to the more traditional intervention techniques.

56.882 Seminar in Mental Retardation
A study of research in the field and its implications for teaching. Intervention strategies will be studied and evaluated.

56.891 Thesis
A research activity that may be elected by the student in lieu of two courses (8 quarter hours), with the approval and recommendation of the adviser.

56.893 Doctoral Dissertation
Prep. admission to candidacy in the Doctor of Education degree program.

56.895 Institute in Special Education
(See general institute description on page 122.)

56.898 Workshop in Special Education
(See general workshop description on page 123.)

56.899 Directed Study
This experience is provided for the student whose unique academic needs or interests cannot be adequately satisfied in any of the scheduled courses of the Department. *Prep. approval of the Chairperson of the Department and of the Director of the Graduate School of Education. (Approval forms must be submitted during the quarter prior to registration for the Directed Study.)*

INSTITUTES

50.895, 51.895, 51.896, 52.895, 53.895, 55.895, 56.895, 56.995

A department may offer a special institute in a specific field of interest from time to time. The institute may be a collaborative one offered by the several departments in the College of Education and will usually include a special institute faculty drawn from resources outside the University, as well as from the College of Education faculty. The institute will focus on a specific area of academic study and may be interdisciplinary in nature; it involves total time commitments on the part of participants in morning, afternoon, and evening sessions five or six days per week for one to eight weeks, depending upon the nature and scope of the institute. Institutes are customarily designed for participants who are currently employed in a common field of work and who are desirous of receiving additional preparation in new methods, new materials, and new content areas. Graduate credit will be granted for successful completion of an institute but may not be applied toward a degree program at the

University without the approval of the department in which the student is doing his major field of specialization degree work. All institute participants must be degree candidates in the Graduate School of Education or must qualify, prior to registration, as special graduate students. *Prep. permission of institute instructor.*

WORKSHOPS

50.898, 51.897, 51.898, 52.898, 53.898, 55.898, 56.898, 56.998

A department may offer a special workshop in a specific field of interest from time to time. Emphasis in the workshop will be focused on development of instructional materials or resolution of practical problems within a single school or institutional setting, or for a group of potential workshop participants who are currently employed in a common field of work. Graduate credit will be granted for successful completion of a workshop but may not be applied toward a degree program at the University without the approval of the department in which the student is doing his major field of specialization degree work. All workshop participants must be degree candidates in the Graduate School of Education or must qualify, prior to registration, as special graduate students. *Prep. permission of workshop instructor.*

INTERDEPARTMENTAL COURSES

93.801 Seminar in Early Childhood Education Theory and Practice
The seminar will provide students with the opportunity to focus on issues not specifically covered in other course work. Consideration will include such topics as: health and nutrition, diagnosis of childhood diseases, classroom organization and management, referral of children with special problems, licensing, financing, and the like. Emphasis on all these topics is relative to early childhood education and settings. Specialists on the various topics will assist in seminar teaching.

93.802-803 Practicum in Early Childhood Education I and II (8 quarter hours)
The early childhood practicum is a supervised teaching experience extending over three consecutive quarters, although students will register for this for only two quarters. To fulfill the requirement, students must meet in practicum seminars for a total of twenty-four times during the placement. Assignment to practicum settings will be made through the Director of Field Placement in association with the practicum adviser. Practicum placements will be made in accord with students' backgrounds, experience, and progress in the program.

DEPARTMENTAL DIRECTORY

	Office	Telephone Number
Bureau of Field Services	118 CU	437-3298
Counselor Education	405 CU	437-3276
Curriculum and Instruction	227 CU	437-3302
Director of Field Placement	96 CA	437-3280
Educational Administration	82 CA	437-3286
Foundations of Education	306 CU	437-3282
Graduate School of Education	118 CU	437-2708
Rehabilitation Administration	6 RB	437-2485
Special Education	6 RB	437-2485
Speech Pathology and Audiology	133 FR	437-2493

UNDERGRADUATE COLLEGES

Offering full-time day curricula on the Cooperative Plan leading to baccalaureate degrees

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college of Criminal Justice
College of Education
College of Engineering
College of Liberal Arts
College of Nursing
College of Pharmacy and Allied Health Professions
Lincoln College

Offering part-time curricula during late afternoon and evening hours leading to associate and baccalaureate degrees

Lincoln College
University College

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graduate school of engineering northeastern university 1976-7

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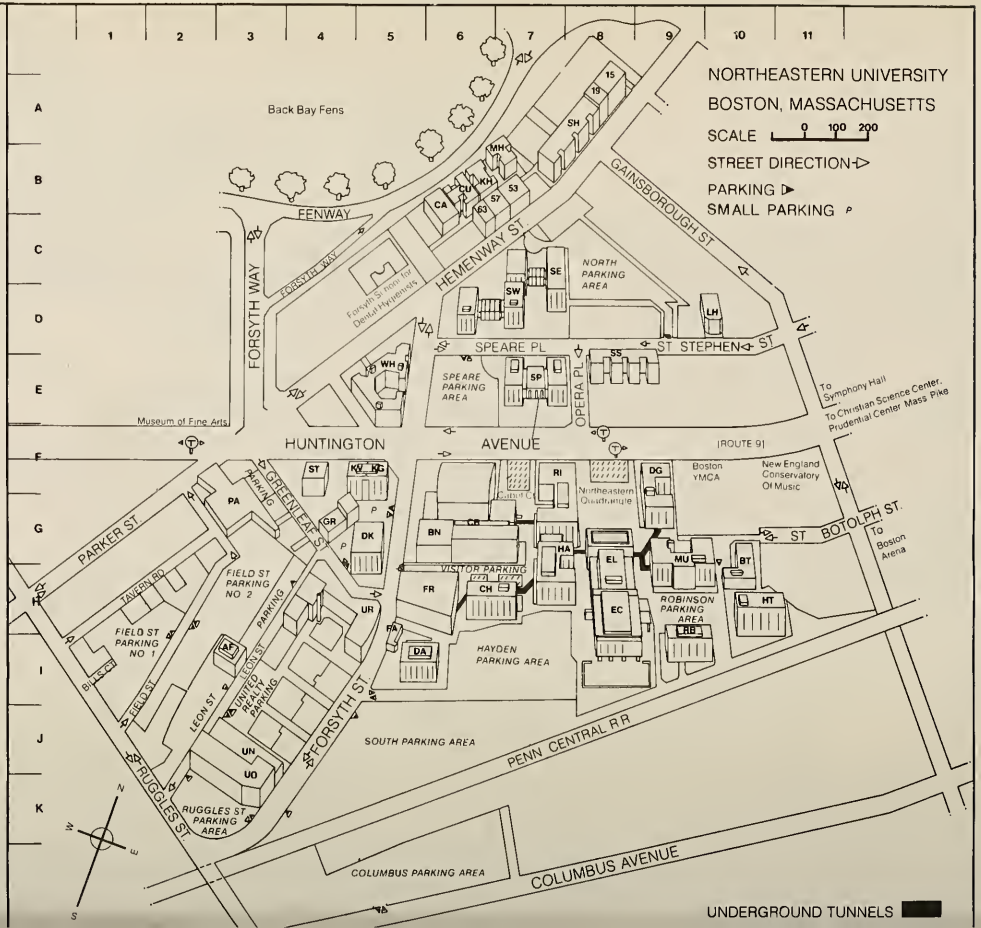
Academic and Service Buildings	Map Code	Bldg. Code
African-American Institute	I3	AF
Barletta Natatorium	G6	BN
Botolph Building	G10	BT
Cabot Physical Education Center	G6	CB
Cahners Hall	C6	CA
Churchill Hall	H6	CH
Cooperative Education Building	F4	ST
Cushing Hall	B6	CU
Dana Research Center	I5	DA
Dockser Hall	G5	DK
Dodge Library	G9	DG
Ell Student Center (Auditorium section)	G8	EL
Ell Student Center (Student Lounge section)	H8	EC
Forsyth Building	H6	FR
Forsyth Building Annex	H5	FA
Greenleaf Building	G4	GR
Hayden Hall	G7	HA
Hurtig Hall	H11	HT
Kerr Hall (Faculty Center)	B6	KH
Knowles Center (Gryzmish Hall section)	F5	KG
Knowles Center (Volpe Hall section)	F5	KV
11 Leon Street	J3	UO
15 Leon Street	J3	UN
Mugar Life Sciences Building	G9	MU
Parker Building	G3	PA
Richards Hall	F7	RI
Robinson Hall	H10	RB
United Realty Building	H5	UR
Dormitories		
115 Hemenway Street	A8	15
119 Hemenway Street	A8	19
153 Hemenway Street	B7	53
157 Hemenway Street	B6	57
163 Hemenway Street	C6	63
Kerr Hall	B6	KH
Light Hall	D10	LH
Melvin Hall	B7	MH
106-122 St. Stephen Street	E8	SS
Smith Hall	B8	SH
Speare Hall	E7	SP
Stetson Hall East	C7	SE
Stetson Hall West	D7	SW
White Hall	E5	WH



ACADEMIC CALENDAR 1976—1977

Fall Quarter 1976

Registration period		
Burlington	Tuesday—Wednesday	Sept. 14—15
Boston	Monday—Thursday	Sept. 20—23
Interview period for new students by appointment*	Monday—Thursday	Sept. 20-23
Classes begin	Monday	Sept. 27
Examination period	Monday—Saturday	Dec. 13—18

Winter Quarter 1976—1977

Registration period		
Burlington	Tuesday	Nov. 30
Boston	Monday—Thursday	Dec. 6—9
Interview period for new students by appointment*	Monday—Thursday	Dec. 6—9
Classes begin	Monday	Jan. 3
Examination period	Monday—Saturday	Mar. 21—26

Spring Quarter 1977

Registration period		
Burlington	Tuesday	Mar. 8
Boston	Monday—Thursday	Mar. 14—17
Classes begin	Monday	Apr. 4
Last day to file card for Spring Commencement	Friday	Apr. 1
Last day to pay fee for Spring Commencement	Friday	Apr. 29
Final grades due in Registrar's Office for June graduates	Friday	June 3
Examination period	Monday—Saturday	June 13—18
Spring Commencement	Sunday	June 19

Summer Quarter 1977

Registration period		
Burlington	Monday—Tuesday	June 13—14
Boston	Wednesday—Thursday	June 15—16
Interview period for new students by appointment*	Wednesday—Thursday	June 15—16
Classes begin	Monday	June 27
Last day to file card for Fall Commencement	Friday	July 1
Last day to pay fee for Fall Commencement	Monday	Aug. 1
Examination period	Wednesday—Thursday	Aug. 3—4

* Appointments for interviews with new students must be made at least four days before the date of the interview.

† Examinations for day classes will be held in accordance with the undergraduate examination schedule.

UNIVERSITY HOLIDAYS 1976—1977

Columbus Day	Monday	October 11
Veterans' Day	Thursday	November 11
Thanksgiving Recess	Thursday—Saturday	November 25—27
Christmas Vacation	Monday—Saturday	Dec. 20—Jan. 1
Martin Luther King Day	Saturday	January 15
Washington's Birthday	Monday	February 21
Patriot's Day	Monday	April 18
Memorial Day	Monday	May 30
Independence Day	Monday	July 4
Labor Day	Monday	September 5

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admissions, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or on the basis of being a handicapped but otherwise qualified individual. In addition, Northeastern takes affirmative action in the recruitment of students and employees.

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University Graduate Council
1976—1977

The Council determines broad policies and regulations governing the conduct of graduate work. All new graduate programs must be approved by the Council.

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the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of nearly 180 distinguished business and professional men and women.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922); Liberal Arts (1935); Education (1953); Pharmacy (1962); Nursing (1964); Boston-Bouvé College (1964); the College of Criminal Justice (1967); and by Lincoln College's daytime Bachelor of Engineering Technology program (1971). This educational method enables students to gain valuable practical experience as an integral part of their college program and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, actuarial science, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. University College offers evening courses — offered by the University since 1906 — and adult-day courses leading to the bachelor's degree. In addition to offering day undergraduate programs in Electrical Engineering Technology and Mechanical Engineering Technology, Lincoln College offers evening/part-time certificate, associate, and bachelor degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the Basic College faculties concerned.

GRADUATE AND PROFESSIONAL SCHOOLS

The ten graduate and professional schools of the University offer day and evening programs leading to the degrees listed.

The Graduate School of Actuarial Science offers the degree of Master of Science in Actuarial Science.

The Graduate School of Arts and Sciences offers the degrees of Master of Arts, Master of Science, Master of Science in Health Science, Master of Public Administration, and Doctor of Philosophy.

The Graduate School of Boston-Bouvé College offers the degree of Master of Science.

The Graduate School of Business Administration offers the degree of Master of Business Administration.

The Graduate Program in Criminal Justice offers the degree of Master of Science.

The Graduate School of Education offers the degree of Master of Education and Doctor of Education and the Certificate of Advanced Graduate Study.

The Graduate School of Engineering offers the degrees of Master of Science, Engineer degree, Doctor of Engineering, and Doctor of Philosophy.

The School of Law offers the degree of Juris Doctor.

The Graduate School of Pharmacy and Allied Health Professions offers the degrees of Master of Science and Doctor of Philosophy.

The Graduate School of Professional Accounting offers the degree of Master of Science in Accounting.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established in 1960 to relate the University to the needs of its community in a period of accelerated change. Adult education programs offered by the Center and University College have since been consolidated. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

RESEARCH ACTIVITIES

The facilities of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

buildings and facilities

MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, the Boston Public Library, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan-suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 48 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

Ell Student Center

The Carl S. Ell Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

Libraries

The University library system consists of the Dodge Library, which is the main library; the Suburban Campus Library at Burlington; the School of Law Library; and divisional libraries for Physics and Electrical Engineering, Chemistry and Biology, Mathematics and Psychology, Health, Physical and Recreation Education, and Physical Therapy. There are additional subject collections for the Center for Management Development at Andover, Massachusetts, and the Marine Science Institute in Nahant.

The library collections number 400,000 volumes supplemented by some 333,000 titles in microprint, microfilm, and microfiche forms. The collection includes, in addition, some 3,700 periodical titles, 100,000 documents, and 4,600 sound recordings.

Cabot Physical Education Center

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. It contains four basketball courts, an athletic cage, a women's gymnasium, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouvé College.

A recent addition to the center, the Barletta Natatorium, houses a 105-foot swimming pool, a practice tank for the crew, handball courts, and shower and dressing facilities.

Dockser Hall

Charles and Estelle Dockser Hall, completed in 1968, houses a large gymnasium, dance studio, motor performance laboratory, college library, community recreation laboratory, folk arts center, dark and music rooms, recreation resources area, locker rooms, offices, classrooms, conference room and lounge, storage facilities, and a research laboratory.

Apartments for Upperclass Students

The University maintains a 100-apartment housing unit which accommodates 279 people. Two-, three-, and four-party apartments are available which vary in size from two to four rooms plus bath. Apartments are furnished with beds, chairs, desks, stove, refrigerator, and kitchen table. The cost includes all utilities.

A $100 deposit is required when making application for the apartments. Applications are available in the Office of University Housing. Students are expected to make such arrangements on a term-to-term basis but may live in the apartments both while on cooperative work assignments and in school if they wish. All reservations are made on a first-come, first-served basis.

SUBURBAN FACILITIES

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, physics, mathematics, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor's degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

Warren Center

The Warren Center is a practical laboratory for Boston-Bouvé College in outdoor education and conservation, in group practicum, and in camping administration, programming, and counseling. At this Center in Ashland, completed in 1967, there are tennis courts, field hockey and lacrosse fields, waterfront for swimming and boating, overnight camp sites, fields and forests, heated cottages, the Hayden Lodge with a recreation hall, library, crafts shop, dining facilities, and conference accommodations.

Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

Marine Science Institute

The Marine Science Institute at Nahant, Massachusetts, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated all year, and is about 20 miles northeast of Boston. Many of the courses at this institute are applicable toward an advanced degree in biology or health science.

Government Center Campus

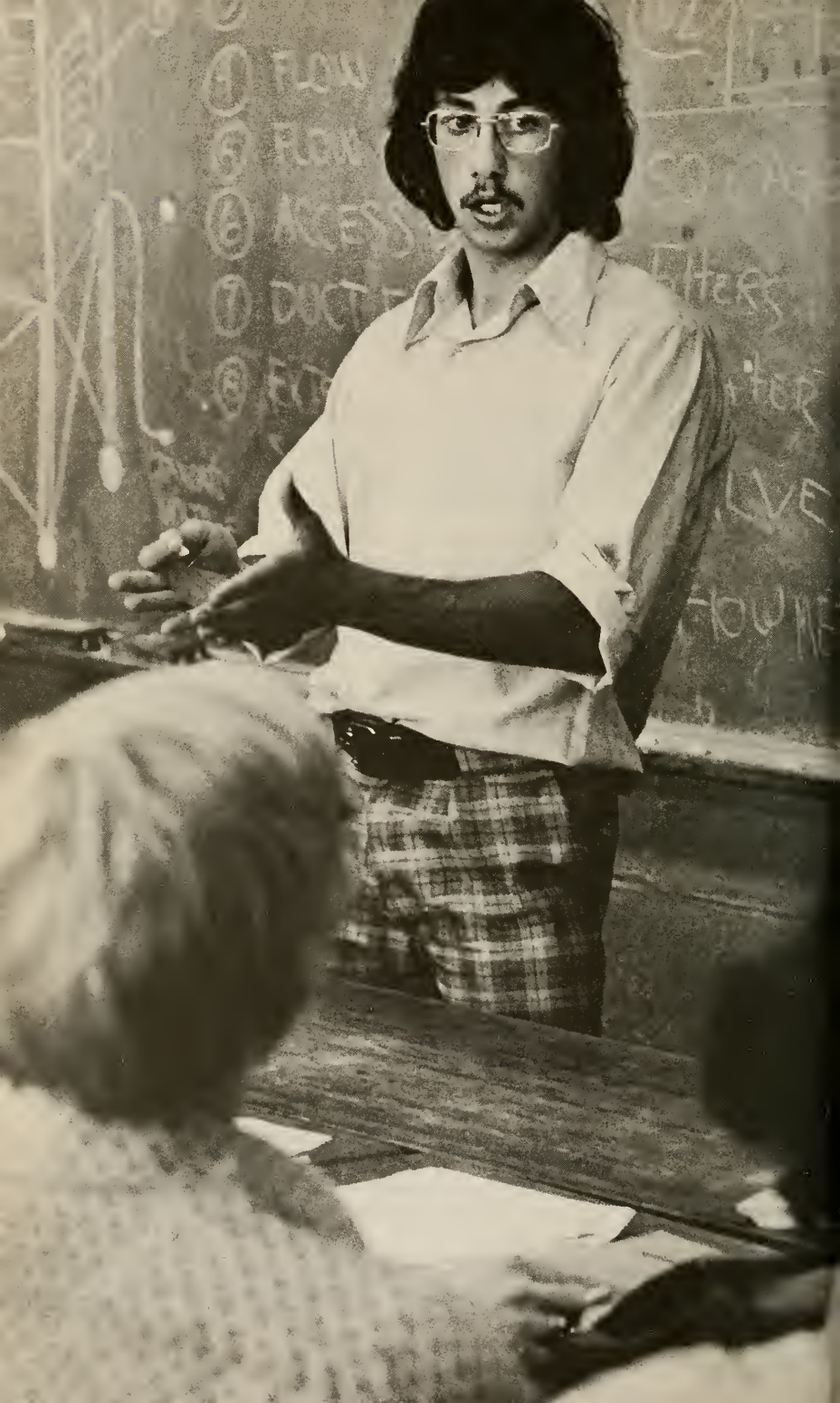
With the cooperation of the Federal Executive Board, the Graduate School of Liberal Arts' Department of Political Science offers an entire Master of Public Administration program at the John F. Kennedy Building in downtown Boston. This program is primarily for individuals employed in Federal, state, or local civil services.

Brockton, Nashua, and Framingham Campuses

For students residing in southeastern Massachusetts and northeastern Rhode Island, the Graduate School of Business Administration offers a significant portion of its M.B.A. Program at facilities in Brockton, Massachusetts. These facilities, made available by the Knapp Corporation, are located on West Chestnut Street in Brockton.

Students residing in the southern New Hampshire area may take a significant portion of the M.B.A. Program at facilities in Nashua, New Hampshire. These facilities are furnished by Sanders Associates, Inc. and are located in their headquarters on Route 3, just over the Massachusetts line.

For students in the Framingham-Worcester area, a significant portion of the M.B.A. Program may be taken at classroom facilities located in Framingham, Massachusetts.


FLOW
ACCESS

regulations of the graduate school of engineering

The Master of Science degree may be earned in Chemical Engineering, Civil Engineering, Electrical Engineering, Industrial Engineering, Mechanical Engineering, and Engineering Management. In addition, there are programs leading to the Doctor of Philosophy degree in Chemical Engineering, Civil Engineering, Electrical Engineering, and Mechanical Engineering. The Doctor of Engineering degree is offered in Chemical Engineering. The Engineer degree may be earned in Electrical Engineering, Mechanical Engineering, and Industrial Engineering.

Cooperative Programs

A unique feature of Northeastern's Graduate School of Engineering is the full-time Cooperative Education Plan. This program adopts the philosophy that a balanced exposure to theory and practice will provide students with a more meaningful education.

All engineering graduate departments offer full-time programs on the Cooperative Plan. The program includes nine months of classroom study and twelve months of work experience in an industrial concern. The cooperative student is able to gain vital experience in a professional environment while also supplementing his tuition payments.

The University has a full-time experienced staff to assist the student in obtaining a cooperative work assignment. The student may also wish to investigate employment opportunities on his own in order to facilitate final placement by the graduate coordinator.

An illustration of term sequence within the two-year Cooperative Education Plan is shown below:

	First Year	Second Year
Fall Quarter	class	work
Winter Quarter	work	class
Spring Quarter	class	work
Summer Quarter	work	

Normally, the Cooperative Plan operates as shown above. Economic conditions, the military, citizenship, and other factors may cause a departure from the normal Plan. Students who are admitted to a masters degree program under the Cooperative Plan must complete, through satisfactory performance, each cooperative work assignment in order to be eligible for their degree.

Engineering Sponsorships (Beginning Academic Year 1975)

Another aspect of Cooperative Education is the Engineering Sponsorship Program. This program provides students with exposure to academic theory and industrial experience. The sponsoring Company, by employing the students during cooperative work quarters, provides a monthly salary for the two (2) year period plus a tuition stipend.

All students who are accepted as full-time cooperative students are considered for Engineering Sponsorships. Notification will be received prior to April 15th if a student has been chosen for a sponsorship. Those students not chosen are still eligible for placement under the Cooperative Plan of Education.

GENERAL REGULATIONS

The general regulations and minimum requirements for all graduate programs are established by the University Graduate Council. In some matters the committee of each graduate school is allowed discretion to establish regulations within limits defined by the council. The regulations and academic requirements which follow have been formulated in accordance with this general policy.

Application Procedures

All applicants for cooperative full-time or continuous full-time study at the master's level should address inquiries to their respective departments or to the Graduate School of Engineering. Application forms and reference blanks will be mailed to the applicant. This material, together with the $15.00 non-refundable application fee, necessary transcripts, two letters of recommendation, the Graduate Record Examination scores when required, and the results of the Test of English as a Foreign Language (required of all applicants whose native language is not English), should be returned to the Graduate School of Engineering Office as soon after January 15th as possible. The Admissions Committee will notify applicants as soon as their material is complete.

All applicants for part-time study at the master's level should request an application from the Graduate School of Engineering Office. The completed application, the non-refundable $15.00 application fee and an official transcript should be sent to the graduate school no later than two weeks prior to the interview and registration period for the quarter in which the applicant plans to begin his program. The dates of the interview and registration periods are announced in the catalog (see academic calendar) and in the circular issued each July. Applicants will be notified by mail regarding acceptance. Mailed applications will be accepted up to two weeks prior to the registration period for the quarter in which the applicant plans to begin the program.

If an applicant is unable to submit the application material by mail at least two weeks prior to the registration period, he should call the Graduate School Office to arrange for a personal interview to determine his qualifications for admission. The application, the non-refundable $15.00 application fee and the official transcript may be submitted at the interview.

In some cases, the Graduate Record Examination may be required of applicants. The examination is administered by the Educational Testing Service, Box 955, Princeton, New Jersey, 08540. Applicants must make their own arrangements with the Educational Testing Service for the examination.

Test scores for Graduate Record Examinations and Test of English as a Foreign Language sent to the Graduate School of Engineering are retained for only one year from the date they were taken. If an applicant does not enroll in the quarter for which he was accepted, but delays his registration for a period of one year or more from the date that he originally took his examinations, he must repeat the examinations or resubmit the original test scores before he will be permitted to register.

Transcripts

Official transcripts of previous college training must be supplied with the mailed application if an admissions decision is to be rendered by return mail, or submitted at the personal interview. If this is not feasible, the official transcripts must be mailed to the Graduate School of Engineering as soon after the initial registration as possible. Students who have attended institutions outside of the United States should provide comparable certified documents. Failure to file the necessary transcripts will result in the student being asked to withdraw.

Admission

To be admitted for graduate work, an applicant must have obtained a Bachelor of Science degree in engineering or a closely related science from a recognized college or university with an acceptable quality of undergraduate work. His scholastic record, therefore, must show ability to pursue creditably a program of graduate study, and his undergraduate training must indicate breadth as well as adequate preparation in the field in which the applicant expects to do advanced work. Acceptance to the school is granted upon recommendation of the departmental graduate committee or its designate following a review of the application and supporting material. The recommendation is based upon promise of academic success and fulfillment of minimum criteria established by each department in the Graduate School of Engineering.

Students with an engineering or related science bachelor's degree, who are enrolled in another graduate school at Northeastern, may transfer to the Graduate School of Engineering. However, they must make application and

file the necessary documents, the same as transfers from other colleges or universities. The submission of registration materials for engineering course work does not constitute enrollment in the Graduate School of Engineering.

Registration

Students must register within the dates and times listed on the school calendar. The place of registration will be announced prior to each period.

Auditors are not permitted. All students attending any course in the Graduate School of Engineering must be officially registered by the Registrar and listed on the class roster.

Residence

All work for advanced degrees must be completed at the University unless approval has been obtained from the director of the graduate school for work taken elsewhere. Students who are in residence and are using the facilities of the University must register for such work.

Programs of Study

The curricula of the degree programs are given under each departmental heading. The descriptions of courses offered by the several departments are given so that prospective students may obtain a view of the course coverage. Preparation courses are indicated when necessary. Not all courses are offered every year, but the course offerings will be arranged in such a manner that students may make continuous progress toward the degree.

The Graduate School of Engineering issues a circular close to July 1st which gives the courses for the following academic year and the times at which they meet.

The number of students enrolled in each class will be limited to permit effective teaching at the graduate level. The University reserves the right to cancel, postpone, combine, or modify any course.

At the time of his first registration, each full-time student must develop, with the assistance of his faculty adviser, a complete program of study for the degree for which he is registered. All subsequent changes must be approved by his faculty adviser.

Part-time students will be expected to complete the required courses outlined by each department, after which the elective courses may be undertaken. The study load for such students is limited to a program of two courses per quarter (one course in the summer) unless special permission to carry a heavier load is given by the director of the graduate school.

Grading System

The performance of students in graduate courses will be recorded by the instructor by use of the following grades:

A Excellent
This grade is given to those students whose performance in the course has been of very high graduate caliber.

B Satisfactory
This grade is given to those students whose performance in the course has been at a satisfactory level.

C Fair
This grade is given to those students whose performance in the course is not at the level expected in graduate work.

F Failure
This grade is given to those students whose performance in the course is unsatisfactory.

In addition, the following letter designations are used:

I Incomplete
This grade is given to those students who fail to complete the work of the course.

S Satisfactory without quality designation.

U Unsatisfactory without quality designation.
These grades are used for the first quarter of a two-quarter sequence in which the grade for the second quarter applies to both the first and second quarters of the sequence. The designations S and U may also be used for thesis and seminar work.

Incomplete Grades

The I grade will be changed to a letter grade upon removal of the deficiency which caused the grade of I to be reported. Deficiencies must be made up within the quarter following that for which the grade of I is received unless an extension of time is granted by the instructor. However, such extension of time may not exceed two additional consecutive calendar quarters.

Any student who wishes to make-up a final examination must obtain permission from the director of the graduate school by the second week of the quarter succeeding that in which the examination was missed. The make-up examination must be taken in that succeeding quarter unless circumstances warrant permission of the director to defer it to one of the next two quarters.

A student who has attained an inordinate number of incompletes may, at the discretion of the Committee on Graduate Study in Engineering be asked to withdraw for failure to show continuous progress toward the degree.

Class Hours and Credits

All credits are entered as quarter hours. A quarter hour of credit is equivalent to three fourths of a semester hour credit. All classes meet on a quarter basis. In the summer session, classes meet for six-week periods. The academic calendar in the front of this catalog should be consulted for the opening and closing dates of each academic quarter.

Continuity of Program

Students are expected to maintain continuous progress toward the degree. Any student who has not attended the Graduate School of Engineering for a period of one year must apply to the director for readmission.

Withdrawals

In order to withdraw from a course, a student must fill out an official withdrawal form obtained at the Registrar's Office or at the Suburban Campus Office. Withdrawals may be made through the ninth class meeting of the quarter. Students will be withdrawn as of the date on which they fill out the official withdrawal form. Ceasing to attend a class or notifying the instructor does not constitute an official withdrawal.

Requests for withdrawal from a course after the ninth class meeting of the quarter may be submitted to the Director of the Graduate School, and may be approved to avert unusual hardships on a student.

Changes in Requirements

The continuing development of the graduate school forces frequent revision of curricula. In every new bulletin some improvements are indicated. When no hardship is imposed on the student because of changes, and when the facilities of the school permit, the student is expected to meet the requirements of the latest bulletin. If the student finds it impossible to meet these requirements, the bulletin for the year in which he entered becomes the binding one.

Filing for the Degree

Each student who plans to graduate either in June or September must submit to the Registrar's Office a completed commencement data card prior to the deadline listed in the academic calendar for that commencement at which he expects to receive the degree. If the deadline for filing is not met there is no assurance that the degree will be awarded that year. The commencement data card is supplied with the registration materials or is available in the Registrar's Office.

THE MASTER'S DEGREE

Admission

Specific requirements for each degree program will be found in the appropriate paragraphs for each academic department in the Graduate School of Engineering. General Requirements are listed under *Application Procedures.*

Academic Classifications

Students initially entering the Graduate School are classified into one of three groups according to their admission qualifications.

Regular students are those who meet in full all admittance criteria based on the standards established by the Committee on Graduate Study in Engineering.

Provisional students are those whose records are above the minimum required for acceptance but do not qualify them for regular admission based on the standards established. Therefore, provisional students must obtain a B average in their first 12 quarter hours of course work to continue in the graduate school and be reclassified as regular.

Special students are those who do not wish to pursue a master's degree program or who may already possess the master's degree. Special students with only the bachelor's degree must meet the same admission criteria as the regular or provisional student and will be limited to a maximum of 12 quarter hours of graduate credits.

Any student whose record is not satisfactory may be dropped from the program regardless of his classification.

Academic Requirements

A candidate for the master's degree must satisfactorily complete an approved program consisting of a minimum of 40 quarter hours of correlated work of graduate caliber and such other study as may be required by the department in which he is registered.

To qualify for the Master of Science degree from the Graduate School of Engineering each student must have an average grade accumulative of not less than B with no more than 12 credits below a B in all courses undertaken at Northeastern University. The Committee on Graduate Study in Engineering allows eight quarter hours of credit to be taken, in addition to the stated degree requirements, to repeat failed required courses or to substitute for elective courses to obtain the required B average for completion of degree requirements. The number of I grades that a student may accrue will be limited.

Within the above limitations for extra or repeated courses, a required course for which a grade of F is received must be repeated with a grade of C or better, and may be repeated only once. If a grade of F is received in an elective course, that course may be repeated once to obtain a grade of C or

better, or another elective course may be substituted for it. If a grade of C is received in a required course, that course may be repeated once to obtain a grade of B or better.

Comprehensive Examination

At the discretion of the department, a final written or oral comprehensive examination may be required. Such examinations will be given at least two weeks before the commencement at which the degree is expected.

Thesis

If a thesis is required in partial fulfillment of degree requirements, it must show independent work based in part upon original material, and must meet the approval of the departmental graduate committee.

The thesis must receive a grade of B or better to be accepted. Instructions for the preparation of the thesis may be obtained from the department.

Transfer Credits

A maximum of 12 quarter hours of credit obtained at another institution may be accepted toward the master's degree provided that the credits transferred are in the candidate's field, consist of work taken at the graduate level for graduate credit, carry grades of A or B, have been earned at a recognized college or university, and have not been used toward any other degree. Students should petition the Graduate School of Engineering in writing for all transfer credits. Grades on transfer credits may not be used for the purpose of obtaining the academic average necessary for completion of the degree requirements.

Time Limitations

Course credits earned in the program of graduate study, or accepted by transfer, are valid for a maximum of seven years unless an extension is granted by the graduate school committee.

Fellowships

The departments of the Graduate School of Engineering have two types of fellowships available. Some departments have teaching assistantships and research fellowships for students enrolled in work leading to the master's degree. The departments which give doctoral degrees also have research fellowships for such students.

Assistantships

Some departments have teaching assistantships, on the Cooperative Plan, in which students alternate full-time academic work with full-time work in the department. Some departments also have available research fellowships. Applications for traineeships must be filed by March 15, with

two letters of recommendation and a transcript of all prior college work. All students must have their course program approved by the chairman of the respective department before the student registers.

Cooperative Programs

All the departments offer the Cooperative Education Plan. The Plan consists of nine months of classroom study and twelve months of work experience in an industrial concern.

Full-Time Program

All the departments offer a continuous full-time program in which the requirements for the master's degree can be completed in one academic year.

Part-Time Program

Most of the departments offer part-time programs in which the admission requirements are the same as for full-time programs. However, the program is established in such a way that students may progress according to their abilities and the time available. The curricula of the part-time programs are specified by the departments.

An official transcript of prior college work must be submitted with an application by those who apply by mail, or at the personal interview for those who apply after the deadline for mailing. Mail applications will be accepted up to two weeks prior to the registration period for the quarter in which the applicant plans to enter the Graduate School.

Honorary Societies

Northeastern University has chapters of Tau Beta, Pi, Sigma Xi, and Phi Kappa Phi. Graduate students are eligible for consideration for election to these societies in accordance with the admission requirements of each organization.

THE DOCTOR OF PHILOSOPHY DEGREE

The Doctor of Philosophy degree is awarded to candidates who give evidence of high attainment and research ability in their major field. The degree requirements are administered by committees in charge of each degree program. These committees may be departmental graduate committees or the committee of the graduate school, depending upon the nature of the program. It is the responsibility of the chairman of the committee to certify to the Graduate School of Engineering the completion of each requirement for each candidate.

Admission

Each degree program has an established admission procedure for students starting their doctoral work at Northeastern University. Initial contact should be with the chairman of the appropriate department.

Classification and Degree Candidacy

Students taking advanced graduate work are classified as follows:

1. Doctoral Student
   Students in this classification have been admitted to a doctoral program.
2. Doctoral Degree Candidate
   Students in this classification are doctoral students who have completed 40 quarter hours of acceptable graduate work beyond the bachelor's degree and have passed the qualifying examination.
3. Special Students
   This classification is given to students taking advanced graduate work who are not enrolled for a master's degree, and who have not been admitted to a doctoral program.

Residence Requirement

Candidates for the Doctor of Philosophy degree must spend the equivalent of at least one academic year in residence at the University taking graduate work. The committee of each degree program specifies the method by which the residence requirement is satisfied.

Qualifying Examination

Students must pass a qualifying examination within time limits set by the committee of the degree program. The material covered in the qualifying examination and the level of course work necessary to prepare for the examination are established by the committee for each program.

Comprehensive Examination

Degree programs may require a comprehensive examination during the time in which a student is a degree candidate. The purpose of this examination is to test the knowledge and skills of the student in a particular area and his knowledge of recent research developments in his field.

Course Requirements

The minimum course requirements of 40 quarter hours constitute the work normally required for a master's degree. The course requirements beyond this are the doctoral course requirements and the amount of such work necessary in each doctoral program is specified by the committee in charge of the doctoral program.

Dissertation

Each doctoral student must complete a dissertation which embodies the results of extended research and makes an original contribution to the field. This work should give evidence of the candidate's ability to carry out independent investigation and interpret in a logical manner the results of the

research. The method of approval of the dissertation is established by the committee in charge of the degree program. The original bound copy of the dissertation must be deposited in the library.

Language Requirement

The foreign language requirement and how it is satisfied is established by the committee in charge of each degree program.

Final Oral Examination

The final oral examination will be taken after completion of all other requirements for the degree. This examination must be held at least two weeks before the commencement at which the degree is to be awarded.

The committee for the final oral examination for the doctoral degree is appointed by the committee in charge of the degree program, and the director of the graduate school is notified of the time of the examination.

The final oral examination will be on the subject matter of the doctoral dissertation and significant developments in the field of the dissertation. Other fields may be included if recommended by the examining committee.

Transfer Credit

If transfer credit for doctoral course work is desired, approval for such transfer credit must be given by the committee in charge of the degree program.

Time Limitation

After the establishment of degree candidacy, a maximum of five years will be allowed for the completion of the degree requirements. If a student wishes to obtain a time extension, he may, with the approval of the committee of his degree program, petition the Committee on Doctoral Degree Programs of the University Graduate Council for such extension.

Registration

All students must register for course work or dissertation as approved by their advisers or the departmental registration officer. After the first registration for doctoral work, registration must be continuous unless withdrawal is allowed by the committee in charge of the degree program. Students must be registered for dissertation during the quarter in which they take the final oral examination.

THE DOCTOR OF ENGINEERING DEGREE

The Doctor of Engineering degree is awarded to candidates who give evidence of high attainment and ability in their major field. The degree requirements are administered by committees in charge of each degree program. These committees may be departmental graduate committees or the committee of the graduate school, depending upon the nature of the

program. It is the responsibility of the chairman of the committee to certify to the Graduate School of Engineering the completion of each requirement for each candidate.

Admission

Each degree program has an established admission procedure for students starting their doctoral work at Northeastern University. Initial contact should be with the chairman of the appropriate department.

Classification and Degree Candidacy

Students taking advanced graduate work are classified as follows:

1. Doctoral Student
   Students in this classification have been admitted to the doctoral program.
2. Doctoral Degree Candidate
   Students in this classification are doctoral students who have completed 40 quarter hours of acceptable graduate work beyond the bachelor's degree and have passed the qualifying examination.
3. Special Students
   This classification is given to students taking advanced graduate work who are not enrolled for a master's degree, and who have not been admitted to a doctoral program.

Residence Requirement

Candidates for the Doctor of Engineering degree must spend the equivalent of at least one academic year in residence at the University taking graduate work. The committee of each degree program specifies the method by which the residence requirement is satisfied.

Qualifying Examination

Students must pass a qualifying examination within time limits set by the committee of the degree program. The material covered in the qualifying examination and the level of course work necessary to prepare for the examination are established by the committee for each program.

Comprehensive Examination

Degree programs may require a comprehensive examination during the time in which a student is a degree candidate. The purpose of this examination is to test the knowledge and skills of the student in a particular area and his knowledge of recent research developments in this field.

Course Requirements

The minimum course requirements of 40 quarter hours constitute the work normally required for a master's degree. The course requirements

beyond this are doctoral course requirements, and the amount of such work necessary in each doctoral program is specified by the committee in charge of the doctoral program.

Dissertation

The dissertation for the Doctor of Engineering degree is fundamentally different from that of the Doctor of Philosophy degree. In general, the latter focuses on contributions to new knowledge in the engineering sciences and is expected to demonstrate the student's competence as a researcher. The dissertation for the Doctor of Engineering degree focuses on creative engineering design and in-depth engineering studies. It may, and usually will, contain elements that involve research, but above all, it must demonstrate the student's ability to work creatively on engineering analysis and design problems such as those encountered in professional practice.

Language Requirement

There is no foreign language requirement, but, in lieu of such a requirement, the student must demonstrate proficiency in computer software techniques and an acceptable machine language.

Final Oral Examination

The final oral examination will be taken after completion of all other requirements for the degree. This examination must be held at least two weeks before the commencement at which the degree is to be awarded.

The committee for the final oral examination for the doctoral degree is appointed by the committee in charge of the degree program, and the director of the graduate school is notified of the time of the examination.

The final oral examination will be on the subject matter of the doctoral dissertation and significant developments in the field of the dissertation. Other fields may be included if recommended by the examining committee.

Transfer Credit

If transfer credit for doctoral course work is desired, approval for such transfer credit must be given by the committee in charge of the degree program.

Time Limitation

After the establishment of degree candidacy, a maximum of five years will be allowed for the completion of the degree requirements. If a student wishes to obtain a time extension, he may, with the approval of the committee of his degree program, petition the Committee on Doctoral Degree Programs or the University Graduate Council for such extension.

Registration

All students must register for course work or dissertation as approved by their advisers or the departmental registration officer. After the first

registration for doctoral work, registration must be continuous unless withdrawal is allowed by the committee in charge of the degree program. Students must be registered for dissertation during the quarter in which they take the final oral examination.

Professional Experience

The student is required to present evidence of at least one calendar year of experience in engineering practice at a suitable professional level. This experience must have been acquired after completion of a bachelor's degree in a branch of engineering. The committee in charge of each degree program specifies the details of the professional experience requirement.

INTERDISCIPLINARY PROGRAMS

Some graduate students may wish to pursue doctoral programs which involve substantial work in two or more departments. To meet this need, an interdisciplinary program may be established which corresponds in scope and depth to doctoral standards, but does not agree exactly with the individual departmental regulations. For such possibilities, the following plan is in operation:

Admission

Application for admission to interdisciplinary doctoral study consists of the submission of a carefully thought-out written proposal describing the areas of proposed study and research. The proposal may be a part of the initial application for admission to graduate study at Northeastern University, or it may be submitted by a student already enrolled. It may be directed to a doctoral degree-granting department or to the director of the graduate school, who directs it to the appropriate department. In either case, admission to interdisciplinary doctoral study requires favorable recommendation by the sponsoring doctoral degree-granting department and approval by authorized representatives of the graduate study committees of the departments appropriate to the disciplines covered by the applicant's proposal. The sponsoring department becomes the registration base of the student.

Formation of Interdisciplinary Committee

A student who has been accepted for interdisciplinary study must obtain the consent of an adviser who will direct his doctoral thesis. This adviser, who may or may not be a member of the registration department, will be chairman of the interdisciplinary committee for this student. A second member will be appointed from the registration department by its chairman. These two members will obtain one or more additional members or request the director of the graduate school to do so. At least two departments must be represented on the committee and a majority of the committee must come from doctoral degree-granting departments. The chairman of the registration department will notify the director of the

graduate school of the membership of the committee as soon as arrangements are complete.

Duties of Interdisciplinary Committee

A member of the interdisciplinary committee who is also a member of the registration department will serve as the registration officer to approve the course registration for the student. A copy of the approved course registration must also be filed with the other committee members and with the graduate study committee of the registration department.

The interdisciplinary committee will be responsible for the admistration of the qualifying examination, language examination, approval of the dissertation, and comprehensive examination. This committee must also certify to the registration department the completion of the requirements for the award of the doctoral degree.

The interdisciplinary committee must assure that the program of the student represents standards comparable to those of the registration department and that the program is not so broad that it has inadequate depth in any area.

The program of the student may be reviewed at any time by the director of the graduate school to determine whether objectives of the program are being met.

THE ENGINEER DEGREE

The degree of Engineer is intended for those who do not wish to make a commitment to post-master's degree graduate study that is as extensive as that required for one of the doctor's degrees. It is an intermediate degree, between master's and doctor's degrees. A student who has completed the Engineer degree is eligible to apply for admission to a doctor's degree program.

Admission

Each departmental Engineer degree program has its own admission procedure for students beginning the program. Normally a master's degree in engineering or related field is required. Initial contact should be with the chairman of the appropriate department.

Classification and Degree Candidacy

A student admitted to the Engineer degree program will be designated as a candidate for this degree.

Residence Requirement

Candidates for the Engineer degree must spend the equivalent of at least two academic quarters in residence at the University taking graduate work. The committee of each degree program specifies the method by which the residence requirement is satisfied.

Qualifying and Comprehensive Examinations

The committee for each Engineer degree program specifies its own examinations. Normally, no qualifying examination is required for candidacy and no comprehensive examination is required for completion, but individual departments offering the degree may require such examinations.

Course Requirements

The minimum course requirement will be 40 quarter hours beyond the master's degree, with no more than 10 quarter hours of credit out of the 40 allowed for work on the dissertation. A minimum of 20 quarter hours must be taken in the department in which the degree is offered. Specific course requirements for each Engineer degree program are determined by the departmental committee in charge of the program.

Dissertation

Each Engineer degree student must complete a dissertation which demonstrates a high level of competence in engineering research, development, or design. As a general guideline, the amount of effort normally expected will be the equivalent of about 10 quarter hours of graduate course work.

Language Requirement

No foreign language is required for the Engineer degree.

Final Oral Examination

A final oral examination may be required by the departmental committee in charge of the Engineer degree program. The examination will normally consist of a defense of the dissertation.

Transfer of Credit

Approval for transfer of credit must be given by the departmental committee in charge of the degree program.

Time Limitation

After admission to the program, a maximum of five years will be allowed for completion of the degree requirements. Extension of this time limit may be granted with the approval of the departmental committee in charge of the degree program.

Registration

All students must register for course work or dissertation as approved by their advisers or the departmental registration officer. After the first registration for this work, registration must be continuous unless withdrawal is allowed by the departmental committee in charge of the degree program.

financial information

FINANCIAL OBLIGATIONS

Tuition

Tuition rates and fees are subject to revision by the Board of Trustees at any time. However, any change in tuition and fees will become effective at the beginning of the school year which follows the one in which the change was announced.

The tuition rate for all graduate students is $67 per quarter hour of credit. Doctoral candidates actively utilizing the resources of the University in their Doctor of Philosophy or Doctor of Engineering dissertation are charged an additional $600 per quarter. Those doctoral candidates registered for dissertation work to be performed off campus are charged $200 per quarter in addition to tuition. Degree candidates that are no longer full time students yet still need to complete thesis or dissertation requirements will be charged a continuation fee. This will entitle the student to limited access of various University facilities and privileges.

Tuition statements are mailed to students by the Bursar's Office and are payable by cash or check to Northeastern University on or before the date specified.

Fees

A $15.00 non-refundable application fee must accompany the application for admission to the Graduate School of Engineering. No applications will be processed until the fee has been received.

Upon notification of acceptance, all full-time applicants are required to pay a tuition deposit of $50.00 This deposit will be credited to the student's tuition, and it is not refundable for those who do not register.

Other fees include a charge of $10 for late payment of tuition and a commencement fee of $25 for all degree candidates, payable before commencement by the date listed in the academic calendar.

For full-time students there is a charge of $12.50 per quarter for the services available in the Student Center. The fee for teaching assistants and research fellows is $6.25 each quarter. All part-time students on the Huntington Avenue Campus are charged $.75 a quarter.

All full-time students pay a non-refundable University Health Service fee of $120 each year. This fee will provide Blue Cross-Blue Shield coverage and entitle the students to the medical care furnished by the University Health Services.

All financial obligations to the University must be discharged by graduation.

Refunds

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal form filed by the student. Nonattendance does not constitute official withdrawal. Questions regarding refunds should be discussed with the Bursar's Office.

Refunds will be granted in accordance with the following schedule:

Official Withdrawal Filed Within:	Amount of Refund: Percentage of Tuition
First week of quarter	100
Second week of quarter	75
Third week of quarter	50
Fourth week of quarter	25

FINANCIAL AID

The Graduate School of Engineering has available the following types of assistantships and fellowships for support of graduate students. Those interested in financial aid must apply through the chairman of the major department. The chairmen or representatives of the Department are listed in the catalog under the Committee on Graduate Study in Engineering.

Teaching Assistantships

Teaching assistantships allowing remission of tuition and a stipend are available in all departments. Holders of such awards devote half time to academic assistance directly related to the teaching function and the balance to course work.

Graduate Administrative Assistantships

Some University departments offer the graduate student an opportunity for remission of tuition and a stipend in return for half time spent in assisting with non-teaching, administrative duties.

Tuition Assistantships

Many departments provide remission of tuition for students who share in the administrative work of the department. These awards are normally given to full-time students in the first year of graduate work.

Research Fellowships

A number of departments offer research fellowships including N.I.H. and N.S.F. that carry a stipend and remit tuition. Certain of these grants require half-time work on research in the department, with the remaining time devoted to course work. Others provide for full-time work on research used for thesis or dissertation.

Doctoral Research Fellowships

In the departments which give work leading to the Ph.D. degree, research fellowships available for students who have established candidacy for the Ph.D. degree carry a higher stipend than fellowships at the master's level.

Appointments

Appointments to fellowships and assistantships are ordinarily announced no later than April 15 for the following academic year or summer. Appointments are for a maximum of one year and are not automatically renewed. Students who hold assistantships and research fellowships are expected to devote full time to their studies and the duties of the grant. They may not accept outside employment without the consent of their faculty advisers and the director of the graduate school.

FINANCIAL AID OFFICE

The Office of Financial Aid offers two types of assistance to graduate students: the National Direct Student Loan and Work-Study. All awards are based on financial need. Aid granted from these programs sponsored by the Federal Government is dependent upon the amount of funds allocated to Northeastern University.

National Direct Student Loan

Under the National Direct Student Loan program, students may be allowed to borrow as much as $1500 per academic year; however, the total amount borrowed must not exceed $10,000 for the student's entire undergraduate and graduate program. Repayment and interest on these loans do not begin until nine months after the student ceases to carry at least a half-time academic load. The repayment of the principal may be extended over a ten-year period with an interest rate of 3% per annum.

College Work Study Program

The College Work-Study Program is sponsored by the Federal Government. It is designed to give students an opportunity to earn as much as $3.50 per hour working in jobs on or off campus in public or private nonprofit organizations.This program is administered solely by the Office of Financial Aid and is not to be confused with the University's cooperative education program.

Martin Luther King, Jr. Scholarships

Established in 1969 in memory of the late Rev. Martin Luther King, Jr., awards are made as openings occur to qualified minority graduate students who show financial need and are accepted to full-time study in the Graduate Schools of the University. Stipends will cover tuition and all fees.

Guaranteed Student Loan Program

A prime means of financial assistance is the Guaranteed Student Loan Program. Because of the easy availability of this loan relative to other types of financial assistance, it is recommended that all applicants for aid first seek assistance from this source. Students may receive guaranteed loans of up to $2500 per academic year from their local banks. Repayment of the principal and interest need not begin until nine months after the student ceases to carry at least a half-time academic load.

Northeastern University is a participant in the Graduate and Professional School Financial Aid Service (GAPSFAS). All applicants for financial aid must file a GAPSFAS form in order to be considered. This form may be obtained from the financial aid officer at the institution which the student now attends or from the Northeastern University Office of Financial Aid. All sections of the GAPSFAS form must be completed and sent to the Graduate and Professional School Financial Aid Service, Box 2614, Princeton, New Jersey 08540. No decision on an application for financial aid will be made until the GAPSFAS form is received.

Only students who have been officially accepted as degree candidates to a graduate school of Northeastern University may apply for financial aid. The University does not award financial assistance to students who are not citizens or permanent residents of the United States.

The Office of Financial Aid does not award Graduate Assistantships or Fellowships. For further information regarding such assistance, students should contact the Chairmen of the major department.

National Defense Student Loans

This program is available to students who are carrying at least one-half the normal academic load, are accepted as degree candidates, and who show evidence of financial need.

The Federal maximum a graduate student may borrow is $5000 while pursuing his post-baccalaureate degree.

Repayment and interest on these loans do not begin until nine months after the student ceases to carry at least a half-time academic load at an institution of higher education. The repayment of principal may be extended over a ten-year period with the interest at the rate of 3% per annum. Repayment may be deferred up to a total of three years while a borrower is serving as a Peace Corps or VISTA volunteer.

Additional information and application forms are availble from the Office of Financial Aid. The application deadline is September 1 for full-time students. For other students the deadline is six weeks prior to the start of the quarter for which aid is requested.

Dormitory Proctorships

A number of proctorships in dormitories on or near the Huntington Avenue campus are available each year. Appointments carry a minimum compensation of room and board. Further information and application forms may be obtained from the Office of University Housing.

faculty

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John D. Macey, B.S., M.S., *Lecturer in Engineering*
Robert N. Martin, B.S., M.S., *Associate Professor of Electrical Engineering*
Francis D. McCarthy, B.E., M.E.E., Ph.D., *Associate Professor of Electrical Engineering*
John D. McLellan, B.A., *Lecturer in Engineering*
William J. Meehan, B.S., M.E., *Lecturer in Engineering*
Robert L. Meserve, B.S., M.S., *Associate Professor of Civil Engineering*
Stephen Miliaras, B.S., M.S., *Lecturer in Engineering*
Marvin M. Miller, B.S., M.A., Ph.D., *Lecturer in Engineering*
Ernest E. Mills, B.S., M.S., *Associate Professor of Mechanical Engineering*
Peter F. Mueller, B.S., M.S., *Lecturer in Engineering*
James D. Murphy, B.S., *Lecturer in Engineering*
Paul J. Murphy, B.S., M.S., *Lecturer in Engineering*
Richard J. Murphy, B.S., M.S., Ph.D., *Associate Professor of Mechanical Engineering*

Warren G. Nelson, S.B., S.M., Sc.D., *Associate Professor of Mechanical Engineering*
Robert A. Nery, B.S., *Lecturer in Engineering*
Walter Newman, B.S., M.S., *Lecturer in Engineering*
David D. Nickerson, A.B., M.B.A., *Lecturer in Engineering*
Leslie M. Novak, B.S., M.S., Ph.D., *Lecturer in Engineering*
Welville B. Nowak, S.B., Ph.D., *George A. Snell, Professor of Engineering and Chairman, Department of Mechanical Engineering*
Robert M. O'Brien, B.S., *Lecturer in Engineering*
James C. O'Shaughnessy, B.S., M.S., Ph.D., *Assistant Professor in Civil Engineering*
Robert E. Parkin, B.S., Ph.D., *Associate Professor of Electrical Engineering*
Kenneth Paulin, B.S., M.S., *Lecturer in Engineering*
Ronald F. Perry, B.S., M.S., Ph.D., *Assistant Professor of Industrial Engineering*
Thomas E. Phalen, Jr., B.S., M.S., *Associate Professor of Mechanical Engineering*
Walter H. Phoenix, B.B.A., *Lecturer in Engineering*
John Proakis, B.S., M.S., Ph.D., *Associate Professor of Electrical Engineering*
Harold R. Raemer, B.S., M.S., Ph.D., *Professor of Electrical Engineering and Chairman of the Department.*
Wilfred J. Remillard, B.S., M.S., Ph.D., *Professor of Electrical Engineering*
George O. Reynolds, B.S., M.S., *Lecturer in Engineering*
Howard H. Reynolds, A.B., Sc.D., *Lecturer in Engineering*
J. Spencer Rochefort, B.S., M.S., *Professor of Electrical Engineering*
John P. Rody, B.S., M.S., *Lecturer in Engineering*
John N. Rossettos, B.S., M.S., Ph.D., *Associate Professor of Mechanical Engineering*
Rauinder Sakhuja, B.S., M.S., Sc.D., *Lecturer in Engineering*
Gerald D. Saks, B.M.E., M.B.A., *Lecturer in Engineering*
Sheldon S. Sandler, B.S., M.S., Ph.D., *Associate Professor of Electrical Engineering*
Malukutla Sarma, *Associate Professor of Electrical Engineering*
Gerhard O. Sauermann, B.S., M.S., Ph.D., *Lecturer in Engineering*
Martin Schetzen, B.E.E., S. M., Sc.D., *Professor of Electrical Engineering*
Miknail Schiller, B.S., M.S., *Lecturer in Civil Engineering*
John K. Schindler, S.B., M.S., Ph.D., *Lecturer in Engineering*
Walter C. Schwab, S.B., S. M., Ph.D., *Professor of Electrical Engineering*
Richard J. Scranton, B.S., M.S., *Assistant Professor of Civil Engineering*
Al U. Sharon, B.S., M.S., *Lecturer in Engineering*
Michael B. Silevitch, B.S., M.S., Ph.D., *Assistant Professor of Electrical Engineering*
Nelson Simons, B.S., M.S., D.Eng., *Associate Professor of Electrical Engineering*
Barkey Siroonian, B.A., M.S.P.H., M.S., *Lecturer in Engineering*
Sidney L. Smith, S.B., S.M., Ph.D., *Lecturer in Engineering*
Michael Smolin, B.S., M.S., Ph.D., *Lecturer in Engineering*
Richard L. Stevens, B.S., Juris Dr., *Lecturer in Engineering*
Gary K. Stewart, B.S., M.S., Ph.D., *Assistant Professor in Engineering*
Richard R. Stewart, B.S., M.S., Ph.D., *Associate Professor of Chemical Engineering*
Robert D. Stuart, B.A., M.A., Ph.D., *Professor of Electrical Engineering*
Raimundas Sukys, B.S., M.S., *Research Associate in Electrical Engineering*
Henry J. Therege, B.A., B.S., M.S., *Lecturer in Engineering*
Charles W. Therrien, S.B., S.H., Ph.D., *Lecturer in Engineering*
Ralph A. Troupe, B.S., M.S., Ph.D., *Professor of Chemical Engineering and Chairman of the Department*
Thomas Vasilos, B.S., Sc.D., *Lecturer in Engineering*
Yash P. Verma, B.S., M.S., Ph.D., *Associate Professor of Electrical Engineering*
David M. Waxman, B.S., M.S., *Lecturer in Engineering*
Irvine W. Wei, B.S., M.S., Ph.D., *Assistant Professor of Civil Engineering*
Lih-Jyh Weng, B.S., M.S., Ph.D., *Lecturer in Engineering*
John A. Williams, B.S., M.S., Ph.D., *Associate Professor of Chemical Engineering*
Bernard T. Woodrow, B.S., M.S., *Lecturer in Engineering*
Leslie E. Woods, *Lecturer in Engineering*
Alvin J. Yorra, B.S., M.S., *Associate Professor of Mechanical Engineering*
Joseph J. Zelinski, B.S., Ph.D., *Professor of Mechanical Engineering*
John Zotos, B.S., M.S., Met.E., *Associate Professor of Mechanical Engineering*

civil engineering

Admission

To be enrolled for graduate work leading to the degree of Master of Science in Civil Engineering, applicants must have obtained a Bachelor of Science degree in Civil Engineering, with an acceptable quality of undergraduate work, from a recognized institution. Applicants with a Bachelor of Science degree from a recognized institution in some other engineering field or related science and an appropriate background of preparation may pursue this program and qualify for the degree of Master of Science.

THE MASTER'S DEGREE

General

The master's degree requirements can be completed on the Cooperative Plan, on a full-time basis or part-time in the evening. Forty quarter hours of academic work are required. A master's report carrying 4 Q.H. of credit, or a thesis of 8 Q.H. credit is required in all fields of civil engineering (environmental, structural and transportation).

A meaningful sequence of electives must be chosen which meets the approval of the department. Department interviews are necessary early in the program for all students in order that an approved program of electives may be arranged with the individual. It is suggested that only required courses be taken in the first quarter. During that quarter an interview should be scheduled within the department for preliminary planning of the remainder of the individual program.

Full-Time Program on the Cooperative Plan

On the Cooperative Plan students enroll for academic work in the Fall and Spring Quarters of the first year and in the Winter Quarter of the second year. The other three quarters of the two academic years and the summer after the first year are available for professional employment. Students who are admitted to a master's degree program under the Cooperative Plan must complete, through satisfactory performance, each cooperative work assignment in order to be eligible for their degree.

Full-Time Program

Arrangements may be made to complete the degree requirements in one year on a continuous full-time basis.

Part-Time Programs

The admission requirements for these programs are similar to those for the full-time program, but students may progress according to their ability to combine their study load with their employment load. A maximum of seven years is allowed to complete the program.

Substitutions

With the approval of the department, substitutions may be made for some of the prescribed courses by other courses in the department or in other departments which offer graduate work.

Students may petition to substitute eight quarter hours of approved course work for the required four quarter hours Master's Report.

STRUCTURAL ENGINEERING

The Structural Engineering Program emphasizes basic courses in Structural Analysis, Design of Steel and Concrete Structure, and Soil and Rock Mechanics. Advanced topics in Dynamics, Stability, Models and Numerical Methods round out a comprehensive presentation which may be supplemented by offerings from other programs, such as mechanical engineering or industrial engineering.

SPECIMEN DAY PROGRAM

Fall Quarter		**Credits**
1.847	Structural Analysis	4
1.853	Concrete Structures I	2
1.877	Eng. Props. of Soils	4
1.861	Design of Structures I	2
1.859	Structural Stability	2
	or	
1.877	Eng. Props. of Soil	4
1.882	Engineering Geology	2
		(Minimum) 14

Winter Quarter		**Credits**
1.854	Concrete Structures II	2
1.862	Design of Structures II	2
1.884	Rock Mechanics I	2
1.894	Numerical Methods in Struct. Mechanics	4
1.897	Master's Report	4
	or	
1.899	Thesis	8
		(Minimum) 14

Spring Quarter		Credits
1.855	Concrete Structures III	2
1.857	Structural Dynamics	4
1.863	Design of Structures III	2
1.878	Foundation Engineering	4
1.885	Rock Mechanics II	2
		(Minimum) 12

The two-credit courses are scheduled for the early evening time block.

PART-TIME PROGRAM

Required Courses		Credits
1.897	Master's Report	4
	or	
1.899	Thesis	8
		(Minimum) 4

Electives (Part-time Program)

Students in the Structural Engineering major must elect 30 quarter hours from civil engineering courses within the structural engineering field (courses in the 840-899 series).

Six quarter hours may be elected from any courses in engineering or science for which the student has the necessary preparation.

The electives will normally be available according to the following schedule:

Fall Quarter		Credits
1.841	Structural Analysis I	2
1.844	Structural Analysis IV	2
1.853	Concrete Structures I	2
1.859	Structural Stability	2
1.861	Design of Structures I	2
1.871	Eng. Props. of Soils I	2
1.874	Foundation Eng. I	2
1.882	Eng. Geology	2

Winter Quarter		Credits
1.842	Structural Analysis II.	2
1.850	Struc. Dyamics I	2
1.854	Concrete Structures II	2
1.862	Design of Structures II	2
1.872	Eng. Props. of Soils II	2
1.875	Foundation Eng. II	2
1.884	Rock Mechanics I	2
1.892	Numerical Methods in Struct. Mechanics I	2

Spring Quarter		Credits
1.843	Structural Analysis III	2
1.849	Model Analysis	2
1.851	Struct. Dynamics II	2
1.855	Concrete Structures III	2
1.863	Design of Structures III	2
1.873	Soils Testing Lab.	2
1.876	Foundation Eng. III	2
1.885	Rock Mechanics II	2
1.893	Numerical Methods in Struct. Mechanics II	2

TRANSPORTATION ENGINEERING

The Transportation Engineering Program is designed for students with career goals in transportation engineering, planning, or research. This program may consist of courses from engineering, liberal arts, and business. A minimum of 40 credit hours is required for a graduate degree.

A Master of Science in Civil Engineering degree will be awarded to students who have an accredited undergraduate degree in civil engineering and have completed at least 24 quarter credit hours in civil engineering courses, i.e. courses designated with 01. - numbers. A Master of Science degree will be awarded to students who do not have an undergraduate degree in civil engineering or who do not meet the minimum 24 quarter credit hour requirement in civil engineering courses. A student may elect to take non-technical electives in liberal arts and business administration. A maximum of nine credit hours in non-technical fields will be allowed.

Each student is required to prepare a program of study which must be reviewed and approved by his faculty adviser. A typical program of study would normally consist of courses shown in the specimen program. Specimen programs listed below for day and part-time students are intended to show the nature of the program. Substitutions for the courses listed in the specimen programs may be made depending on the student's interest, academic background, and career objectives.

For a complete listing of courses and course descriptions, consult appropriate sections of the graduate school catalogues for Engineering, Liberal Arts, and Business Administration. Further information can be obtained within this catalogue under *Graduate Program in Transportation,* which describes the interdisciplinary program in transportation leading to a Master of Science in Transportation degree.

SPECIMEN DAY PROGRAM

Required Courses		Credits
1.834	Transp. Analysis & Planning	4
1.800	Systems Analysis I	4
1.805	Traffic Flow Theory	4
1.837	Interdisciplinary Urban Transp. Seminar	2
1.839	Thesis (Transp.)	6

Suggested Technical Electives

Courses		Credits
1.206	Applied Probability for Civil Engineers	4
1.820	Transp. Engineering	2
1.806	Urban Transp. Analysis	4
1.819	Environmental Impacts of Urban Transp.	4
1.801	Systems Analysis II	4
5.960	Probability and Statistics I	2
5.961	Probability and Statistics II	2
5.962	Probability and Statistics III	2
5.913	Data Processing for Engineers	2
5.914	Advanced Operations Research	4

Suggested Non-Technical Electives

Courses		Credits
22.847	Politics of Transportation	3
39.9L5	Economics of Urban Transp.	3
39.9J8	Physical Aspects of Urban-Regional Development	3
39.9P3	Regional Development	3
39.9R1	Development Planning	3
48.805	Urban Transp. Management	3

PART-TIME PROGRAM

Part-time students are subjected to the same requirements as full-time students. Courses listed above may be taken by part-time students. Some of these courses are not available in the evening, but appropriate substitutions may be made. The following is a list of required courses:

SPECIMEN PART-TIME PROGRAM

Required Courses		Credits
1.834	Transp. Analysis & Planning	4
1.800	Systems Analysis I	4
1.805	Traffic Flow Theory	4
1.838	Master's Report (Transportation)	4
	or	
1.839	Thesis (Transp.)	6

See Specimen Day Program for suggested Technical and Non-Technical Electives.

ENVIRONMENTAL ENGINEERING

Includes areas of specialization such as water resources engineering, water and wastewater engineering, environmental health, air pollution control and solid waste management. A day program on the Cooperative Plan is available.

Part-time students and full-time students not on traineeships or grants-in-aid have the option of undertaking either a Master's Report for 4 Q.H. credit or a Master's Thesis for 8 Q.H. credit. (Students on traineeships or with grants-in-aid may be required to complete a Master's Thesis.)

Suggested programs for both full-time and part-time students are given below. Other programs, tailored to meet individual requirements, may be developed through conferences with the student's adviser.

SPECIMEN DAY PROGRAM

First Academic Quarter		Credits
1.914	Water & Wastewater Treatment	4
*1.923	Environmental Chem.	4
1.933	Environmental Anal.	4
	Elective	2
		14

Second Academic Quarter		Credits
1.922	Env. Bacteriology	2
	Electives	12
		14

Third Academic Quarter		Credits
1.912	Water & Wastewater Treatment III	2
	Electives	6 or 2
1.993	Master's Report	4
	or	
1.991	Thesis	8
		(Minimum) 12

PART-TIME PROGRAM

Required Courses		Credits
1.910	Water & Wastewater Treatment I	2
1.911	Water & Wastewater Treatment II	2
1.912	Water & Wastewater Treatment III	2
*1.920	Env. Chemistry I	2
*1.921	Env. Chemistry II	2
1.922	Env. Bacteriology	2
1.930	Env. Analysis I	2
1.931	Env. Analysis II	2

* These required courses may be waived for those students who have taken Northeastern course 1.223, Environmental Chemistry, or equivalent. Course 1.933 or courses 1.930 and 1.931 will be required of all students.

1.993	Master's Report	4
	or	
1.991	Thesis	8
		20 or 24

Elective Groupings (Day and Part-Time)

Forty (40) quarter hours of academic work are required for the degree, including certain approved electives which are available from other departments. To provide a meaningful grouping of the available technical electives, one of the following sequences of courses must be selected. These are the required courses for each area of specialization. A minimum of 14 quarter hours of elective courses must be obtained from the environmental engineering courses offered by the Civil Engineering Department (900 series). Exceptions to these requirements must receive permission from the Graduate Environmental Committee.

Water and Wastewater Engineering		**Credits**
1.935,	1.936 Environmental Lab (U.O.)	4
1.907	Environmental Statistics	2
1.954	Stream Sanitation	2
1.913	Ind. Waste Disposal	2
1.994	Environmental Eng. Seminar (Trainees Only)	2
	Additional Electives	4 or 8

Environmental Health Engineering & Science		**Credits**
1.985	Environmental Protection	2
1.980	Environmental Planning and Management	2
1.950	Air Pollution	2
1.952	Ind. Hygiene	2
1.955	Air Sampling Analysis	2
	Additional Electives	8 or 12

Water Resources Engineering		**Credits**
1.907	Env. Stat.	2
1.908,	1.909 Hydrology I, II	4
1.960,	1.961, 1962 Hydr. Structures	6
1.901,	1.902, 1.903 Hydraulics	6
	Additional Electives	2

Air Pollution Engineering		**Credits**
1.800	Systems Analysis I	4
1.950	Air Pollution	2
1.955	Air Sampling & Analysis	2
1.957	Air Science	2
	Additional Electives	6 or 10

Civil Engineering (Geotechnical)

At the master's degree level it is possible to undertake concentrated study in geotechnical engineering which is concerned with materials within the earth's crust. Students with this interest should consider the following courses recommended by the Civil Engineering Department to obtain a competent knowledge in the field.

Courses		Credits
1.871	Eng. Prop. of Soils I	2
1.872	Eng. Prop. of Soils II	2
1.873	Soils Testing Lab.	2
1.874	Soil Mechanics and Foundation Eng. I	2
1.875	Soil Mechanics and Foundation Eng. II	2
1.876	Soil Mechanics and Foundation Eng. III	2
1.882	Engineering Geol.	2
1.884	Rock Mechanics I	2
1.885	Rock Mechanics II	2

THE DOCTOR'S DEGREE

Environmental Engineering
Full-Time Program

The following material outlines the procedures for admission to the doctoral program in environmental engineering and the steps necessary to qualify for the Ph.D. degree. For further information applicants should write to the Chairman of the Ph.D. Committee, Department of Civil Engineering.

Admission

Each student admitted to the program will initially have the status of doctoral student. In the usual case, he will have received a master's degree in an appropriate field of engineering or science prior to entry into the program. Applicants should apply to the Chairman of the Ph.D. Committee, Department of Civil Engineering for admission to the doctoral program, preferably by February 1st. The committee will interview the applicant, examine his record, and decide whether he should be admitted to the program. The chairman of the department will appoint a program adviser for each doctoral student, upon the recommendation of the Ph.D. Committee.

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work after admission as a doctoral student. However, it is expected that at least two years of full-time graduate study will be required beyond the master's degree.

Degree Candidacy

Degree candidacy is established in accordance with the general graduate school regulations. At least one year of full-time study and successful completion of the qualifying examination are required for consideration as a doctoral degree candidate.

Qualifying Examination

The qualifying examination will consist of a written and an oral section. The written part will cover: (1) environmental engineering and/or science and (2) selected areas depending upon the educational background and interest of the student. In certain cases the student may be exempted from the written part of the examination. The oral portion will measure general comprehension. If the oral examination is failed, it may be repeated with permission of the departmental graduate committee. The qualifying examination shall be completed no later than two years after admittance as a doctoral student.

Comprehensive Examination

The comprehensive examination is given after the thesis has been completed. This examination is based upon the defense of the thesis.

Course Requirements

Course requirements for each applicant will be determined by the Ph.D. Committee. Formal course work will be selected to meet the individual student's objectives. Graduate level study up to 12 quarter hours of course work, completed under programs other than this full-time program may be accepted, but requires approval of the committee.

Thesis

After degree candidacy has been established, a candidate must complete a thesis which embodies the results of extended research and includes material suitable for publication.

A thesis committee will be appointed by the chairman of the Ph.D. Committee. The thesis committee, consisting ordinarily of five members, two of whom are from other departments, will be informed of the progress of the thesis and will be responsible for its approval.

Language Requirement

A reading knowledge of one foreign language is required. The requirement shall be determined in a manner prescribed by the committee, and must be satisfied prior to taking the oral qualifying examination.

mechanical engineering

The Department of Mechanical Engineering offers the degrees of Master of Science in Mechanical Engineering, Mechanical Engineer, and Doctor of Philosophy. The Master of Science degree can be pursued on either a full-time or a part-time basis. A full-time student may apply for participation in the Cooperative Plan. The Mechanical Engineer and Doctor of Philosophy degrees are pursued on a basis consistent with the residence requirements for the degree. The curriculum offers areas of concentration in Mechanics, Thermofluid Engineering, and Materials Science and Engineering.

THE MASTER OF SCIENCE DEGREE

Admission

To be enrolled for graduate work leading to the degree of Master of Science in Mechanical Engineering, applicants must have obtained from a recognized college or university the degree of Bachelor of Science in Mechanical Engineering, or a closely-allied engineering field, with an acceptable quality of undergraduate work. Applicants with a Bachelor of Science degree in other engineering or related science fields and an appropriate background of preparation may pursue this program and qualify for the degree of Master of Science without specification.

Area of Concentration

Each student must complete the required courses in one area of concentration to be eligible to receive the degree. It is expected that these courses will be completed as early as possible in his academic program. The elective courses in each area of concentration should be chosen with the aid of the student's advisor.

Required Courses

Mechanics		Credits
2.826	Math. Methods for Mech. Eng. I	2
2.827	Math. Methods for Mech. Eng. II	2
2.804	Theory of Elasticity	2
	and	
2.805	Theory of Elasticity	2
	or	

2.819	Fluid Dynamics I	2
	and	
2.820	Fluid Dynamics II	2
2.841	Vibration Theory	2
	and	
2.842	Vibration Theory	2
	or	
2.849	Automatic Cont. Eng.	2
	and	
2.850	Automatic Cont. Eng.	2
	and	
2.851	Automatic Cont. Eng.	2
		12 or 14

Thermofluid Engineering **Credits**

2.826	Math. Methods for Mech. Eng. I	2
2.827	Math. Methods for Mech. Eng. II	2
2.819	Fluid Dynamics I	2
2.820	Fluid Dynamics II	2
2.901	Adv. Thermodynamics	2
2.902	Adv. Thermodynamics	2
2.910	Conduction Heat Trans.	2
2.911	Convection Heat Trans.	2
		16

Materials Science and Engineering **Credits**

2.826	Math. Methods for Mech. Eng. I	2
2.827	Math. Methods for Mech. Eng. II	2
2.954	Adv. Physical Met. I	2
2.956	Adv. Physical Met. II	2
2.970	Mat. Sci. and Eng.	2
2.971	Mat. Sci. and Eng.	2
2.804	Theory of Elasticity	2
	or	
2.960	Thermo. of Materials	2
	and	
2.961	Thermo. of Materials	2
		14 or 16

In addition, Seminar (2.990 and 2.998) and Thesis (2.991) are required for continuous full-time and cooperative plan students in all areas of concentration.

Electives

Students must take sufficient mechanical engineering departmental electives so that the required courses in their major area and the departmental

electives total at least 30 of the 40 quarter hours required for the degree.

The remaining ten credits may be elected from any courses in engineering or science for which the student has the necessary preparation.

Full-Time Program on the Cooperative Plan

The full-time program may be taken on the Cooperative Plan, where students enroll for academic work in the Fall and Winter Quarters of the first year and in the Fall and Winter Quarters of the second year. The other quarters of the two academic years and the summer after the first year are available for professional employment. Students who are admitted to a Master's degree program under the Cooperative Plan must complete, through satisfactory performance, each cooperative work assignment in order to be eligible for the degree.

A thesis of ten quarter hours of credit is required.

For each of the areas of concentration, the sequence of courses on the Cooperative Plan are taken according to the following programs:

Mechanics

First Academic Quarter		Credits
2.826	Math. Methods for Mech. Eng. I	2
2.804	Theory of Elast.	2
	or	
2.819	Fluid Dynamics I	2
2.841	Vibration Theory	2
	or	
2.849	Automatic Cont. Eng.	2
	Electives	4
		10

Second Academic Quarter		Credits
2.827	Math. Methods for Mech. Eng. II	2
2.805	Theory of Elast.	2
	or	
2.820	Fluid Dynamics II	2
2.842	Vibration Theory	2
	or	
2.850	Automatic Cont. Eng.	2
	Electives	4
		10

Third Academic Quarter		Credits
2.990	Seminar	1
2.991	Thesis	5
	Electives	4
		10

Fourth Academic Quarter **Credits**

2.998	Seminar	1
2.991	Thesis	5
	Electives	4
		10

Thermofluid Engineering

First Academic Quarter **Credits**

2.819	Fluid Dynamics I	2
2.826	Math. Methods for Mech. Eng. I	2
2.901	Advanced Thermodynamics	2
2.910	Conduction Heat Transfer	2
	Elective	2
		10

Second Academic Quarter **Credits**

2.820	Fluid Dynamics II	2
2.827	Math. Methods for Mech. Eng. II	2
2.902	Advanced Thermodynamics	2
2.911	Convection Heat Transfer	2
	Elective	2
		10

Third Academic Quarter **Credits**

2.990	Seminar I	1
2.991	Thesis	5
	Electives	4
		10

Fourth Academic Quarter **Credits**

2.998	Seminar II	1
2.991	Thesis	5
	Electives	4
		10

Materials Science and Engineering

First Academic Quarter **Credits**

2.804	Theory of Elast.	2
	or	
2.960	Thermodynamics of Materials	2

2.970	Material Science & Engineering	2
	or	
2.954	Advanced Physical Metallurgy I	2
2.826	Math. Methods for Mech. Engs. I	2
	Electives	4
		10

Second Academic Quarter **Credits**

	Elective	2
	or	
2.961	Thermodynamics of Materials	2
2.971	Material Science & Engineering	2
	or	
2.956	Advanced Physical Metallurgy II	2
2.827	Math. Methods for Mech. Engs. II	2
	Electives	4
		10

Third Academic Quarter **Credits**

2.954	Advanced Physical Metallurgy I	2
	or	
2.970	Material Science & Engineering	2
2.990	Seminar	1
2.991	Thesis	5
	Elective	2
		10

Fourth Academic Quarter **Credits**

2.956	Advanced Physical Metallurgy II	2
	or	
2.971	Material Science & Engineering	2
2.998	Seminar	1
2.991	Thesis	5
	Elective	2
		10

Continuous Full-Time Program

Students may take the 40 quarter hours of academic work on a continuous full-time basis and complete the degree requirements in one academic year. The sequence of courses which students take on this plan is established by their advisor.

Part-Time Program

The admission requirements for the evening part-time program are the same as for the full-time program, but students may progress according to their abilities and the time available.

Advisors for Part-Time Programs

The following faculty members in each area of concentration should be contacted if information is required relative to any academic problems.

Mechanics . . . . . Professor John N. Rossettos
Thermofluid Engineering . . . . . Professor Warren G. Nelson
Materials Science and Engineering . . . . . Professor Richard J. Murphy

THE MECHANICAL ENGINEER DEGREE

The degree of Mechanical Engineer is offered for those who wish to undertake graduate study beyond the Master's degree without committing themselves to a program as extensive as that required for the Doctor's degree. The degree permits a candidate to pursue a course of study at the upper graduate level in more than one area of Mechanical Engineering as distinguished from the specialization usually associated with the doctoral program.

The following material outlines the requirements for the Mechanical Engineer degree. For further information applicants should write to the Chairman of the Graduate Committee, Department of Mechanical Engineering, Northeastern University, Boston, Massachusetts 02115.

Admission

To be admitted to candidacy for the degree of Mechanical Engineer, the applicant will have obtained the degree of Master of Science in Mechanical Engineering, or its equivalent, from a recognized institution. In some cases, where the Master's degree is not in Mechanical Engineering, the applicant may be admitted to the program on a conditional basis with the stipulation that certain deficiencies be removed without credit toward the degree. Such special admission is dependent upon the approval of the Mechanical Engineering Graduate Committee.

In general, an applicant will choose two areas of concentration to give him the broad background which characterizes the degree of Mechanical Engineer. An outline of his program must be submitted to the Graduate Committee for approval before final action can be taken upon his application. It is recommended that the applicant discuss his program with the Graduate Committee and members of the graduate faculty in his areas of concentration prior to submission of his program for approval.

Each applicant must submit to the Graduate Committee prior to March 1: (1) transcripts of his undergraduate and graduate records, (2) three letters of recommendation which indicate his ability to carry out advanced graduate work, and (3) the program of study which he proposes to follow.

Classification and Degree Candidacy

A student admitted to the Mechanical Engineer degree program will be designated as a Candidate for this degree. The Candidate's advisor normally will be the faculty member who will supervise the dissertation.

Residence Requirement

The residence requirement is satisfied by two academic quarters of full-time graduate work during the academic year or by four academic quarters of half-time graduate work during two consecutive academic years. Plans for satisfying the residence requirement on a half-time basis must be approved by the Graduate Committee.

Qualification and Examinations

A student must maintain a "B" average to qualify for the degree. Students admitted on a conditional basis may be required to pass special examinations. The Graduate Committee will determine the need for and will administer any such special examinations. A final oral examination consisting of a defense of the dissertation may be required if the Candidate's advisor and the Departmental Graduate Committee so decide.

Credit Requirements

A minimum of 40 quarter hours of credit beyond the Master's degree is required. Up to 10 quarter hours of credit will be permitted for work on a dissertation. A minimum of 20 quarter hours of credit must be in the Mechanical Engineering Department.

Dissertation

To be awarded the Mechanical Engineer degree, each candidate must complete a dissertation demonstrating a high level of competence in research, development, or design in the field of Mechanical Engineering. The effort normally expected will be the equivalent of 10 quarter hours of graduate course work.

Transfer Credits

Any transfer of credits must be approved by the Mechanical Engineering Graduate Committee.

Time Limitation

After admission to the program, a maximum of five years will be permitted for completion.

Registration

After approval of the Candidate's program, registration must be continuous. Withdrawal or changes in the program must be approved by the Graduate Committee.

THE DOCTOR OF PHILOSOPHY DEGREE

The degree of Doctor of Philosophy is awarded to those candidates who demonstrate high attainment and research ability in the field of Mechanical Engineering.

The following material outlines the requirements for the Doctor of Philosophy degree. For further information applicants should write to the Chairman of the Department of Mechanical Engineering, Northeastern University, Boston, Massachusetts 02115

Admission

The program leading to the Ph.D. degree is open to persons who are candidates for the Master of Science in Mechanical Engineering degree as well as those who have received the degree. Requests for admission to the program should be made to the Chairman of the Department of Mechanical Engineering. Applicants will receive an application for interview form. This form, along with transcripts of all undergraduate and graduate work and three letters of recommendation, must be returned to the Chairman of the Graduate Committee of the Department of Mechanical Engineering by November 1. The applicant will be notified of an interview time. Based upon an evaluation of the applicant's qualifications, the Graduate Committee will inform the applicant whether or not he will be admitted to the program.

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work or by two years of half-time graduate work beyond the Master's degree. However, a student should expect to spend at least two years, or the equivalent, in full-time graduate study beyond the requirements of the Master's degree.

Degree Candidacy

After 40 quarter hours of graduate work have been taken with satisfactory grades and upon successful completion fo the qualifying examination, a student is established as a degree Candidate.

Qualifying Examination

The qualifying examination in the Department of Mechanical Engineering is offered yearly in January and is both written and oral. The written portion of the qualifying examination is six hours in length and covers, with equal emphasis, four different areas. A student must select one area from each of

the three groups A, B, and C, plus another area either listed below or unlisted, but considered equivalent and approved by the Graduate Committee.

A. Concepts of Thermodynamics
Applied Thermodynamics

B. Dynamics
Mechanics of Deformable Bodies

C. Heat and Mass Transfer
Fluid Mechanics
Mechanical Behavior of Materials
Physical Metallurgy

The oral portion of the qualifying examination is conducted by a committee consisting of at least four members appointed by the Graduate Committee. A typical committee is composed of two members specializing in the student's major area plus one member from each of two other areas.

The qualifying examination may be taken by a graduate student who expects to complete the requirements for his Master's degree within three months of the date of the qualifying examination as well as by a person who has already completed the requirements for the Master's degree. Because degree candidacy must be established before the Graduate Committee will act to approve course programs or dissertation proposals, the qualifying examination should be taken at the earliest opportunity. If the examination is failed, it may be repeated with permission of the departmental Graduate Committee.

Course Requirements

To receive the Ph.D. degree a candidate must complete a program of course work approved by the Graduate Committee. Courses completed prior to admittance to the doctoral program are subject to the approval of the Graduate Committee. Each program must contain at least twelve quarter hours of course work, preferably outside of the department, in an area other than that in which the candidate is concentrating. Attainment of a B average for the courses in the "minor" portion of the program will signify satisfactory completion of that portion.

Dissertation

After degree candidacy has been established, a candidate must complete a dissertation which embodies the results of extended research and includes materials suitable for publication.

The departmental Graduate Committee may require the completion of certain course work before permitting dissertation work to commence. A Dissertation Committee will be appointed by the Chairman of the depart-

ment upon the recommendation of the departmental Graduate Committee. The Dissertation Committee will be kept informed of the work and will be responsible for initial approval of the dissertation in its final form.

Language Requirement

A reading knowledge of one foreign language is required. Proficiency in a language shall be determined in a manner prescribed by the departmental Graduate Committee. The language requirement must be fulfilled within six months after the dissertation proposal has been accepted but no less than six months before the degree is granted.

Comprehensive Examination

The comprehensive examination is combined with the final oral examination and is given after the dissertation has been completed and approved. This examination is based upon the subject matter of the dissertation and a defense of it.

Final Oral Examination

The final oral examination is taken after completion of all other requirements for the degree. This examination cannot be held until two weeks have elapsed after the dissertation has been registered and accepted by the Graduate School and must be passed at least two weeks before the commencement at which the degree is to be awarded

The final oral examination will include the subject matter of the doctoral dissertation and significant developments in the field of the dissertation work. Other fields may be included if recommended by the examining committee.

electrical engineering

Admission

To be enrolled for graduate work leading to the degree of Master of Science in Electrical Engineering, applicants must have obtained a Bachelor of Science degree in Electrical Engineering, with an acceptable quality of undergraduate work, from a recognized college or university. Applicants with a Bachelor of Science degree in other engineering or related science fields and an appropriate background of preparation may pursue this program and qualify for the degree of Master of Science without specification. In some cases, students whose Bachelor of Science degree is in some other engineering or related science field may qualify for the degree of Master of Science in Electrical Engineering. This requires special approval of the Department of Electrical Engineering.

THE MASTER'S DEGREE

Full-Time Program on the Cooperative Plan

Forty quarter hours of academic work are required. This program may be taken on the Cooperative Plan. On this plan one group of students takes academic work in the Fall and Spring Quarters of the first year and in the Winter Quarter of the second year. Another group may take the academic work in the Winter Quarter of the first year and in the Fall and Spring Quarters of the second year. In either case, the other three quarters of the two academic years and the summer after the first year are available for professional employment. Students who are admitted to a master's degree program under the Cooperative Plan must complete, through satisfactory performance, each cooperative work assignment in order to be eligible for their degree.

The sequence of courses on the Cooperative Plan will normally be taken according to the following pattern:

First Academic Quarter		**Credits**
3.827	Linear Systems Analysis	4
3.842	Linear Active Circuits	4
3.823	Mathematical Methods in Electrical Engineering	4
	Electives	2 or 4
		14 or 16

Second Academic Quarter		Credits
3.832	Network Synthesis I	4
3.990	Seminar I	2
3.902	Appl. Prob. & Stoch. Proc.	4
	Electives	4 or 6
		14 or 16

Third Academic Quarter		Credits
3.877	Electromagnetic Theory	4
3.991	Seminar II	2
	Electives	8 or 10
		14 or 16

A limited amount of work may be elected from the part-time program.

A thesis for six quarter hours credit is elective with the approval of the chairman of the department. If the thesis option is approved, this work is done in the second year of the program. Details concerning thesis proposals, editorial format, and time schedules are available in the Graduate School Office.

The program of each student will be made up from the required and elective courses available in each term and approved by the student's academic adviser.

Electives

The electives will normally be available according to the following schedule:

Fall Quarter

3.902 Applied Probability and Stochastic Processes
3.959 Control Theory I — Analysis and Synthesis
3.979 Electronic Digital Computers
3.8T0 Numerical Methods and Computer Applications

Winter Quarter

3.902 Applied Probability and Stochastic Processes
3.909 Detection and Estimation Theory
3.962 Control Theory II — Nonlinear and Sampled-Data Systems
3.966 Switching Circuits
3.979 Electronic Digital Computers

Spring Quarter

3.8T9 Digital Filtering
3.902 Applied Probability and Stochastic Processes
3.905 Information Theory and Coding
3.954 Systems Analysis
3.965 Control Theory III — Optimal Control and Stochastic Systems

(Additional electives will be available from the late afternoon portion of the part-time program in all quarters.)

Full-Time Program

For those students whose programs would be better served by full-time study the prescribed courses may be taken in one academic year. The sequence of the required courses will be different from the full-time program on the Cooperative Plan.

POWER SYSTEMS MAJOR

Full-Time Program on the Cooperative Plan

The course requirements vary with the student's background, but generally can be computed on the basis of the minimum of 40 quarter hours of course work.

For students enrolled in Northeastern's Power Systems Program at the undergraduate level, it is possible (and customary) to take 6 q.h. of credit toward the M.S. in the last quarter of their senior year. Normally these courses are 3.900 Applied Probability and Stochastic Processes A, 2 q.h. and 2.237 Nuclear Engineering II, 4 q.h. although other options (e.q. 3.959 Control Systems I, 3.295 Numerical Methods and Computer Applications) are acceptable. This permits a student to accept a co-op assignment during the summer and fall and then to complete the M.S. requirements with full-time study during the winter and spring quarters. Such a student would take the following program.

Winter Quarter		**Credits**
3.827	Linear Systems Analysis	4
3.926	Power Circuit Analysis II	2
3.936	Computers in Power Systems II	2
3.941	Electric Machinery Theory II	2
*3.292	Mathematical Techniques in Electrical Engineering I	4
	Electives	2-4
		16-18

* An acceptable alternative to 3.292 is the equivalent 3.8C1 and 3.8C2 offered in the evening.

Spring Quarter		Credits
3.877	Electromagnetic Theory	4
3.927	Power Circuit Analysis III	2
3.937	Computers in Power Systems III	2
3.931	Power System Planning	4
	Electives	4-6
		16-18

Total Must Equal 34 Credits

Students coming from other institutions, who wish to enroll in the co-operative plan will attend classes during the Fall and Winter of the first year, go out on a cooperative work assignment for the Spring and Summer, and return to finish their studies in the Fall of their second year. A specimen program follows.

Fall Quarter		Credits
3.827	Linear Systems Analysis	4
3.925	Power Systems Analyses I	2
3.935	Computers in Power Systems I	2
3.823	Mathematical Methods in E. E.	4
3.940	Electric Machinery Theory I	2

Winter Quarter		Credits
3.926	Power Systems Analysis II	2
3.877	Electromagnetic Field Theory	4
3.936	Computers in Power Systems II	2
3.941	Elective Machine Theory II	2
3.990	Seminar	2
3.933	Power System Transients	2

Fall Quarter		Credits
3.932	Power System Protection	2
3.945	Power System Transient Stability	2
2.236	Nuclear Engineering I	4
3.959	Control Theory I	4
3.991	Seminar	2

For electives, all power students should consider selections from the power systems courses listed on page 72. Other suitable graduate courses are possible with the approval of the Director of the Power Systems Evening Program.

Continuous Full-Time Program

For those students whose plans would be better suited by continuous

full-time study the prescribed courses may be taken in one academic year. The courses required in the spring quarter will be somewhat different from the specimen programs shown above.

Part-Time Program
Power Systems Major

Forty quarter hours of academic work are required for the master's degree of which 26 quarter hours of credit are specified as follows:

Required Courses		Credits
3.825	Linear Systems Analysis II	2
3.826	Linear Systems Analysis III	2
3.875	Electromagnetic Theory I	2
3.876	Electromagnetic Theory II	2
3.900	Applied Probability and Stochastic Processes A	2
3.8C1	Mathematical Methods in Electrical Engineering I	2
3.8C2	Mathematical Methods in Electrical Engineering II	2
3.926	Power Circuit Analysis II	2
3.927	Power Circuit Analysis III	2
3.936	Computers in Power Systems II	2
3.937	Computers in Power Systems III	2
3.941	Electric Machinery Theory II	2
3.930	Power System Planning	2

In addition to the specified course work, each student must complete 10 of the remaining 14 quarter hours from the Power System Electives listed on page 72.

Part-Time Program
Electrical Engineering

Admission

The admission requirements for the part-time program leading to the degree of Master of Science in Electrical Engineering are the same as for the full-time program, but students may progress according to their abilities and the time available.

All graduate courses presuppose mastery of the subject matter of a modern, fully accredited curriculum in electrical engineering. Applicants who have not taken further academic work for some time since they received their bachelor's degree may be required to take graduate courses to satisfy any deficiencies. For this purpose, the following courses are available:

		Credits
3.975	Precis of Modern Electrical Engineering I	2
3.976	Precis of Modern Electrical Engineering II	2
3.977	Precis of Modern Electrical Engineering III	2
3.978	Precis of Modern Electrical Engineering IV	2

These courses carry graduate credit but a maximum of four quarter hours of credit from this group may be used as elective credit in the degree program.

Program

Forty quarter hours of academic work are required for the master's degree of which 16 quarter hours of credit are specified as follows:

Required Courses		Credits
3.825	Linear Systems Analysis II	2
3.826	Linear Systems Analysis III	2
3.840	Linear Active Circuits I	2
3.841	Linear Active Circuits II	2
3.875	Electromagnetic Theory I	2
3.876	Electromagnetic Theory II	2
3.8C1	Mathematical Methods in Electrical Engineering I	2
	and	
3.8C2	Mathematical Methods in Electrical Engineering II	2
	or	
3.8C4	Mathematical Methods in Electrical Engineering III	2
	and	
3.8C5	Mathematical Methods in Electrical Engineering IV	2
	or	
3.900	Applied Probability and Stochastic Processes I	2
	and	
3.901	Applied Probability and Stochastic Processes II	2

Students lacking the necessary prerequisites for 3.8C1 or 3.8C4 may be required to take undergraduate courses 3.292 or 3.293 to clear this deficiency. By petition, these courses may carry graduate credit.

Electives

In addition to the required course work each student is expected to select a major and a minor area from the list given below. Ten quarter hours of credit must be taken in the major area and six quarter hours of credit taken in the minor area. The area or areas to which a course is assigned is indicated in the following listings. Not every course is assigned to an area. They may be used as one of the free elective courses. Eight quarter hours of credit are free electives which may be selected from graduate courses in

sciences or other engineering departments for which the student has the necessary preparation.

Subject Areas

1. Circuits and Systems

3.830	3.838	3.911
3.831	3.839	3.912
3.832	3.843	3.950
3.833	3.845	3.951
3.834	3.860	3.952
3.835	3.861	3.953
3.837	3.910	3.954

2. Computer Science

3.837	3.935
3.860	3.936
3.861	3.937
3.893	3.966
3.894	3.967
3.895	3.968
3.898	3.969
3.899	3.972
3.8A1	3.973
3.8T1	3.974
3.8T0	3.979
3.8T2	3.985
3.8T3	3.986
3.8T7	3.987
3.8T8	3.988
3.8T9	3.989

3. Fields, Waves and Optics

3.800	3.879	3.918
3.801	3.880	3.919
3.802	3.881	3.920
3.806	3.882	3.921
3.807	3.883	3.922
3.808	3.885	3.923
3.810	3.890	3.924
3.811	3.891	3.980
3.812	3.913	3.981
3.817	3.914	3.982
3.818	3.915	3.983
3.819	3.916	3.984
3.878	3.917	

4. Communications and Control

3.817	3.907
3.818	3.908
3.819	3.909
3.865	3.9C1
3.866	3.9C2
3.867	3.957
3.871	3.958
3.872	3.959
3.873	3.960
3.898	3.961
3.899	3.962
3.900	3.963
3.901	3.964
3.902	3.965
3.903	3.9A1
3.905	3.9A2
3.906	

5. Physical Electronics

3.806	3.854
3.807	3.8G1
3.808	3.8G2
3.853	3.8G3

6. Power Systems

2.905	2.936	3.927	3.940
2.906	2.938	3.928	3.941
2.907	2.942	3.930	3.942
2.920	2.943	3.931	3.943
2.921	2.944	3.932	3.944
2.931	3.810	3.933	3.945
2.932	3.811	3.935	3.955
2.933	3.812	3.936	3.956
2.934	3.925	3.937	
2.935	3.926	3.938	

Quarter-Sequence Courses

Certain courses have an A or B after the course title. In these cases, credit will be given toward the degree only if both the A and B courses are successfully completed.

ELECTRO-OPTICS PROGRAM

The Electro-Optics Program is designed to provide the engineer and scientist with a working knowledge of current electro-optical techniques and systems. Emphasis is placed on application to industrial and research problems.

Admission

To be enrolled for this degree program, applicants must have a Bachelor of Science degree in Electrical Engineering or Physics, with an acceptable quality of undergraduate work from a recognized institution. Admission requirements are those of the regular program in electrical engineering.

Program

Forty quarter hours of academic work are required, of which 18 are specified. At least 12 additional hours of electives in optics are to be chosen from the optics elective listed below. The remaining ten hours may be selected from optics electives or from suitable courses in science or engineering.

Specified Courses		**Credits**
3.8C1	Math. Methods in Elec. Eng. I	2
	and	
3.8C2	Math. Methods in Elec. Eng. II	2
	or	
3.8C4	Math. Methods in Elec. Eng. III	2
	or	
3.8C5	Math. Methods in Elec. Eng. IV	2

3.914	Electro-Optics I	2
3.915	Electro-Optics II	2
3.916	Fourier-Optics I	2
3.917	Fourier-Optics II	2
3.918	Experimental Optics I	2
3.919	Experimental Optics II	2
3.920	Experimental Optics III	2

Optics Electives **Credits**

3.806	Lasers I	2
3.807	Lasers II	2
3.808	Laser Applications	2
3.913	Optical Storage and Display	2
3.921	Optical Properties of Matter I	2
3.922	Optical Properties of Matter II	2
3.923	Optical Properties of Matter III	2
3.924	Advanced Topics in Electro-Optics	2
3.980	Optical Instrument Design Concepts	2
3.981	Principles of Optical Detection I	2
3.982	Principles of Optical Detection II	2
3.983	Fourier Optics III	2
3.984	Spectroscopic Instrumentation	2

MODEL PROGRAM IN ELECTRO-OPTICS

First Year **Credits**

3.8C4	Math. Meth. in Elec. Eng. III	2
3.8C5	Math. Meth. in Elec. Eng. IV	2
3.914	Electro-Optics I	2
3.806	Lasers I	2
3.807	Lasers II	2
3.808	Laser Applications	2
		12

Second Year **Credits**

3.915	Electro-Optics II	2
3.916	Fourier Optics I	2
3.917	Fourier Optics II	2
3.918	Experimental Optics I	2
3.919	Experimental Optics II	2
3.920	Experimental Optics III	2
		12

Third Year		Credits
3.913	Optical Storage and Display	2
3.921	Optical Properties of Matter I	2
3.922	Optical Properties of Matter II	2
3.981	Prin. Optical Det. I	2
3.982	Prin. Optical Det. II	2
3.984	Spectroscopic Instr.	2
		12

Four additional hours of electives are required for a total of 40 credits for the degree.

Course Prerequisites

The prerequisites suggested for each course are given so that the student will receive full benefit from the course. In case of doubt, the student should consult the Director of the Electro-Optics Program or the course instructor.

COMPUTER SCIENCE MAJOR

The Computer Science Program is structured to provide a curriculum of study in computer science and engineering leading to the degree of Master of Science in Electrical Engineering, or Master of Science, with a major in Computer Science.

Admission

To be enrolled for this degree program, applicants must have obtained a Bachelor of Science degree in engineering, mathematics, or the physical sciences from a recognized college or university and must present satisfactory evidence of ability to pursue graduate study.

Program

Forty quarter hours of academic work are required, of which 14 are specified and 26 are elective.

Specified Courses		Credits
3.893	Digital Computer Programming I	2
3.894	Digital Computer Programming II	2
3.972	Electronic Digital Computers I	2
3.973	Electronic Digital Computers II	2
3.8A1	Mathematical Methods in Computer Science	2
3.8T1	Numerical Methods and Computer Applications I	2
3.8T2	Numerical Methods and Computer Applications II	2

Electives

Sixteen quarter hours of credit must be chosen from the following list of courses. It is urged that students take both of the courses in any two-quarter sequence they elect, and at least two courses in any three-quarter sequence they elect.

3.837 Introduction to Graph Theory
3.895 Digital Computer Programming III
3.898 Combinatorial & Optimization Techniques I
3.899 Combinatorial & Optimization Techniques II
3.8T3 Numerical Methods and Computer Applications III
3.8T7 Digital Filtering I
3.8T8 Digital Filtering II
3.904 Error Correcting Coding
3.908 Special Topics in Communication Theory
3.966 Switching Circuits
3.967 Switching Circuits I
3.968 Switching Circuits II
3.969 Switching Circuits III
3.974 Electronic Digital Computers III
3.985 Fundamentals of Automatic Digital Computation I
3.986 Fundamentals of Automatic Digital Computation II
3.987 Fundamentals of Automatic Digital Computation III
3.988 Special Topics in Computer Science
3.989 Computer Peripherals
3.995 Thesis
3.998 Special Problems in Electrical Engineering
5.911 Linear Programming
5.916 Engineering Analysis Utilizing Data Processing
5.941 Management Information Systems

Students must take sufficient electrical engineering departmental courses to total 30 of the 40 quarter hours required for the degree.

Thesis

A thesis carrying six credits may be elected with the approval of the chairman of the department. If the thesis option is approved, this work is done in the second half of the program.

THE DOCTOR'S DEGREE

Full-Time Program

The following material outlines the procedures for admission to the doctoral program and the steps necessary to qualify for the Ph.D. degree. For further information applicants should write to the Secretary, Department of Electrical Engineering.

Admission

Students who are interested in pursuing a doctor's program, should contact the Electrical Engineering Department to request an application. Completed applications, together with transcripts of all prior work and two letters of recommendation, should be forwarded to the Electrical Engineering Department, 412 Dana Hall, no later than December 1 of the preceding year. Following evaluation of this material, the applicant will be informed whether or not he will be permitted to undertake the qualifying examination. A personal interview is not required, but a student may arrange with the Secretary of the Electrical Engineering Graduate Committee, Professor Robert N. Martin (617-437-3041), for an appointment for further program details if desired. A student who has received approval to take the qualifying examination is considered a pre-doctoral student until such time as he passes the examination. Upon successful completion of the qualifying examination he becomes a Ph.D. candidate.

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work or two consecutive years of part-time graduate work. In the latter case, a detailed time schedule must be approved by the student's adviser in order to give evidence that a least half of the time is being devoted to the requirements of the graduate school program.

Qualifying Examination

The Ph.D. qualifying examination has emerged from its role as a requirement for admission to the doctoral program to the dual purpose of, one: serving as an indicator of the student's capability for successful completion of the program, and two: serving as a guide to his adviser in developing a suitable plan of study tailored to the individual needs of the candidate.

With these goals in mind, the candidate is urged to take the qualifying examination early in his graduate program (i.e., not later than the successful completion of 40 quarter hours of graduate work).

The examination is composed of a written and an oral part, and is usually given in the spring quarter of each academic year. The written part covers the following general categories:

(1) Circuits and Electronics
(2) Fields, Waves, and Energy Conversion
(3) Systems
(4) Miscellaneous Topics in Electrical Engineering

For candidates pursuing a Ph.D. with an emphasis in either Computer Science or Modern Optics, the qualifying examination will be appropriately modified.

The oral part is designed to test general comprehension. Together, the oral and written portions of the examination review the factual knowledge of

a typical undergraduate Electrical Engineering program and the understanding of that material from a more mature point of view.

If the examination is failed it may be repeated only with permission of the Graduate Committee upon recommendation of the Ph.D. Qualifying Examination Committee.

Comprehensive Examination

Within three years of his establishment of degree candidacy, the student will be required to demonstrate by means of a comprehensive examination a subject matter knowledge satisfactory for the award of the degree.

The comprehensive examination is an oral examination open to the Electrical Engineering faculty (assistant professor and above in rank) and administered by the student's Thesis Committee. Departmental faculty will be informed of the examination via a departmental notice at least one week prior to the examination. Normally the examination will be given at the time the Thesis Proposal is submitted to the Thesis Committee for approval. As part of this examination the Thesis Committee will review the student's doctoral program and his performance in graduate courses, as well as examine the student on subject matter related to his graduate studies and his thesis area.

Course Requirements

Successful completion of a doctoral program normally requires 70 quarter hours of satisfactory graduate level work exclusive of thesis research and doctoral reading courses.

Doctoral Seminar, 3.993 and 3.994 are the only required courses.

The course work must include a three-course sequence (graduate level) in each of two minor areas. Both minors must be in science, applied science, or a related area. One minor may be chosen from an area of electrical engineering outside the candidate's proposed major area.

Thesis

The candidate's thesis research shall be directed by his Thesis Adviser, whom he shall select upon establishing candidacy. The Thesis Committee shall approve the thesis in final form.

Language Requirement

The language requirement may be satisfied in French, German, or Russian. The Princeton Educational Testing Service Language Examination is used for this purpose. The examination is administered by Northeastern University annually. If necessary, it may be taken at another institution. It must be passed before the final oral examination is taken.

Final Oral Examination

This examination will be held in accordance with the departmental regulations.

THE ELECTRICAL ENGINEER DEGREE

The Department of Electrical Engineering offers the graduate professional degree usually known as the Engineer Degree. This degree, offered at a number of institutions, usually requires about one year of full-time graduate study beyond the master's degree. The official title of the degree is "Electrical Engineer".

The following material outlines the procedures for admission to the Electrical Engineer degree program and the steps necessary to qualify for the degree. For further information applicants should write to Professor Robert A. Gonsalves, Department of Electrical Engineering, Room 329, Dana Hall, Northeastern University.

Admission

Students who are interested in pursuing the Electrical Engineer degree should make application for admission to the program prior to April 1. A master's degree in electrical engineering or its equivalent and the approval of the departmental graduate committee is required for admission. In some cases, where the master's degree is not in electrical engineering, a student may be admitted to the program with the stipulation that certain deficiencies be made up without credit toward the degree.

The Engineer Degree is available on either a full-time or part-time basis.

Classification and Degree Candidacy

A student admitted to the Engineer degree program will be designated as a candidate for this degree.

Residence Requirement

A plan for satisfying the residence requirement must be approved by the student's adviser.

Qualification and Examinations

A student must maintain a B average in order to qualify for the degree. In some instances, a student may be required to take special examinations. Such examinations will be determined in each case by the departmental graduate committee.

Course Requirements

The minimum course requirements will be 40 quarter hours beyond the master's degree, with no more than 10 quarter hours of credit out of the 40

allowed for work on the project report. A minimum of 20 quarter hours must be taken in electrical engineering. The student's course program must be approved by his adviser.

Project Report

Each engineer degree student must complete a project report which demonstrates a high level of competence in research, development, or design in the field of electrical engineering. As a general guideline, the amount of effort normally expected will be the equivalent of about 10 quarter hours of graduate work.

Language Requirement

No foreign language is required for the Electrical Engineer degree.

Final Oral Examination

A final oral examination consisting of a defense of the dissertation may be required if the student's adviser and the departmental graduate committee so decide.

Transfer of Credits

Approval for transfer of credit may be given by the departmental graduate committee upon request from the student.

Time Limitation

After admission to the program, a maximum of five years will be allowed for completion of the degree requirements. Extension of this time limit may be granted with the approval of the departmental graduate committee.

Registration

All students must register for course work or dissertation as approved by their advisers or the departmental registration officer. After the first registration for this work, registration must be continuous unless withdrawal is allowed by the departmental committee in charge of the degree program.

chemical engineering

Admission

To be enrolled for graduate work in Chemical Engineering, applicants usually have obtained a Bachelor of Science degree in Chemical Engineering, with an acceptable quality of undergraduate work from a recognized college or university. However, qualified students with other B.S. or B.A. degrees in science or engineering may be admitted. Such students are required to complete supplementary undergraduate work in addition to the usual M.S. program in order to qualify for the M.S. degree in Chemical Engineering. Complete programs for these students are worked out after the student has made formal application to the program through the Graduate School of Engineering. The undergraduate work required is strongly dependent on the mathematics, chemistry, and engineering background of the applicant. The undergraduate course work in such programs may not be used for degree credit.

THE MASTER'S DEGREE

Full-Time Program on The Cooperative Plan

Forty quarter hours of academic work are required. This program may be taken on the Cooperative Plan where students enroll for academic work in the Fall and Spring Quarters of the first year and in the Winter Quarter of the second year. The other three quarters of the two academic years and the summer after the first year are available for professional employment. Students who are admitted to a master's degree program under the Cooperative Plan must complete, through satisfactory performance, each cooperative work assignment in order to be eligible for their degree.

The sequence of courses on the Cooperative Plan will normally be taken according to the following pattern:

First Academic Quarter*		**Credits**
4.802	Chemical Engineering Mathematics	4
4.829	Chemical Process Control	4
4.891	Kinetics of Chemical Processes	4
4.991	Thesis	2
		14

* Courses listed in the first academic quarter are required for all M.S. candidates.

Second Academic Quarter		Credits
	Chemical Engineering Electives	8
4.991	Thesis	5
		13

Third Academic Quarter		Credits
	Chemical Engineering Electives	8
4.991	Thesis	5
		13

Chemical Engineering Electives

The electives will normally be available according to the following schedule:

Winter Quarter

4.801 Advanced Chemical Engineering Calculations
4.803 Numerical Techniques in Chemical Engineering
4.811 Chemical Engineering Thermodynamics
4.823 Transport Phenomena
4.840 Advanced Management Techniques in the Chemical Industry
4.890 Chemical Reactor Analysis
4.974 Fluid Mechanics

Spring Quarter

4.806 Optimization Techniques
4.845 Advanced Plant Design Concepts
4.850 Chemical Process Pollution Control (Water)
4.973 Heat Transfer

Students may take the program on a continuous full-time basis to complete the degree requirements in one academic year. The sequence of courses which students take on this plan is established by the chairman of the department.

All Ph.D. candidates are required to do an M.S. thesis. All M.S. students not doing a thesis are required to take 4.833 Research Techniques I. In addition, D. Eng. candidates are required to take 4.834 Research Techniques II if they are not doing a thesis. If a student is planning to take Research Techniques I, he or she must notify the department at least one full quarter before the quarter in which it is to be taken. This normally means that a student should notify the Chemical Engineering Department before the end of the Fall semester as to when he or she intends to take 4.833.

M.S. Thesis normally carries twelve quarter hours of academic credit. Research Techniques I carries four quarter hours of credit. The remaining eight quarter hours of credit required to complete the degree requirements

may be taken from any courses which have been approved, in advance, by the departmental graduate registration officer.

With the approval of the chairman of the department, substitutions may be made for some of the prescribed courses by other courses in the department or in other departments which give graduate work.

PART-TIME PROGRAM

The admission requirements for this program are the same as for the full-time program, but students may progress according to their ability to combine their study with their employment. Students must take sufficient day and evening chemical engineering courses so that the required courses in their major total at least 30 of the 40 quarter hours required for the degree. The remaining 10 credits may be elected from any approved courses in engineering or science for which the student has the necessary preparation. Required courses and electives for all degree candidates must be approved by the chemical engineering departmental adviser. A maximum of seven years is allowed to complete the program.

Students wishing to switch their status from part-time to full-time M.S. candidates must notify the Chemical Engineering and make formal application with the Graduate School of Engineering. Such requests are usually granted for the full-time program to begin in the Fall Quarter.

THE DOCTOR OF PHILOSOPHY DEGREE

The following material outlines the procedure for admission to the doctoral program and the steps necessary to qualify for the Ph.D. degree. For further information applicants should write to the Chairman of the Department of Chemical Engineering.

Admission

Applicants who are enrolled as candidates for the degree of Master of Science in Chemical Engineering at Northeastern University should apply in writing to the Chairman of the Department of Chemical Engineering for admission to the doctoral program. Such application must be made by April first of the year in which they expect to receive the master's degree. The departmental graduate committee will examine the record of the applicant and decide whether or not he should be allowed to take the qualifying examination.

Applicants who are enrolled for graduate work at other institutions or who have completed the requirements for the master's degree should write the chairman of the department for an application for an interview. This form, together with transcripts of all undergraduate and graduate work, must be transmitted to the chairman of the departmental graduate committee. The applicant will be notified of an interview time and, after the interview, will be advised if he should make formal application for admission to the doctoral program. Approved applicants must submit an application for

admission as a doctoral candidate and two letters of recommendation not later than April first. The applicant will be notified of the acceptance of his application and the date of the qualifying examination.

Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work or two consecutive years of part-time graduate work. In the latter case, a detailed time schedule must be approved by the departmental graduate committee as evidence that at least half of the time is being devoted to the requirements of the graduate school program. In general, it should be expected that at least two years of full-time work after establishment of degree candidacy will be necessary.

Degree Candidacy

Degree candidacy is established in accordance with the general graduate school regulations.

Qualifying Examination

The qualifying examination includes both written and oral parts and is normally given in the spring and the fall. The written examination, in general, will cover the following areas:

1. General Principles in Chemical Engineering Science
2. Thermodynamics and Stoichiometry
3. Mathematical Procedures and Kinetics
4. Specialized Technological Topics (to be announced)

The oral examination will test general comprehension.

A student may take any or all of the written examinations in each area and may repeat a failed examination, only once, at a later offering. The taking and successful completion of all examinations may not extend over a period greater than 13 months. Previously administered examinations will be available to formal applicants.

Comprehensive Examination

During the time in which a student is a candidate for a doctoral degree he may be required to demonstrate by means of a comprehensive examination a subject-matter knowledge satisfactory for the award of the degree.

Course Requirements

The course requirements in addition to the minimum requirements for establishing degree candidacy will be determined by the departmental graduate committee and the student in consultation with the committee.

Transfer credit will be dealt with on an individual basis by the departmental graduate committee in accordance with the general graduate school regulations.

Thesis

An individual may choose his thesis topic and supervisor as soon as he becomes a doctoral student. In most cases selection of topic will be made immediately after the student has established his candidacy for the Ph.D. degree. He will be expected to discuss with the staff their Ph.D. thesis topics offerings. After these discussions, the student shall notify the adviser, the department head, and the chairman of the departmental graduate committee in writing of his choice of thesis topic and adviser. The chairman of the departmental graduate committee after consultation with the thesis adviser shall appoint an appropriate thesis committee. This committee shall be kept informed of the progress of the thesis and will approve the thesis in its final form.

Language Requirement

The foreign language requirement may be satisfied by a reading knowledge in two languages selected from French, German, and Russian. The examinations are administered by the department and consist of translation from current scientific journals or textbooks.

Final Oral Examination

This examination is held in accordance with the general regulations of the graduate school.

THE DOCTOR OF ENGINEERING DEGREE

The following material outlines the procedure for admission to the doctoral program and the steps necessary to qualify for the Doctor of Engineering degree. For further information, applicants should write to the Chairman of the Department of Chemical Engineering.

Admission

Applicants for the Doctor of Engineering program must either be candidates for the Master of Science degree in Chemical Engineering or have completed the Master of Science program in Chemical Engineering.

Applicants need not have undertaken a master's thesis.

Applicants for the Doctor of Engineering degree must pass the doctorate qualifying examination given to applicants for the Doctor of Philosophy degree in this department.

Applicants must file application forms with the departmental graduate committee along with official transcripts of previous college work, and two letters of recommendation. Applicants will not be considered until all documents have been received. Applicants will be notified promptly as to whether or not they have been accepted.

Residence Requirement

The residence requirement is satisfied only by full-time residence for one academic year. This requirement must be fulfilled after successful completion of the qualifying examination and prior to the end of the five-year period set forth in the general regulations.

Degree Candidacy

Degree candidacy is established in accordance with the general graduate school regulations.

Qualifying Examination

The qualifying examination includes both written and oral parts and is normally given in the spring and the fall. The written examination, in general, will cover the following areas:

1. General Principles in Chemical Engineering Science
2. Thermodynamics and Stoichiometry
3. Mathematical Procedures and Kinetics
4. Specialized Technological Topics (to be announced)

The oral examination will test general comprehension.

A student may take any or all of the examinations in each area and may repeat a failed examination, only once, at a later offering. The taking and successful completion of all examinations may not extend over a period greater than 13 months. Previously administered examinations will be available to formal applicants.

Comprehensive Examination

During the time in which a student is a candidate for a doctoral degree he may be required to demonstrate by means of a comprehensive examination a subject-matter knowledge satisfactory for the award of the degree.

Course Requirements

The course requirements, in addition to the minimum requirements for establishing degree candidacy, will be determined by the departmental graduate committee and the student in consultation with the committee.

Transfer credit will be dealt with on an individual basis by the departmental graduate committee in accordance with the general graduate school regulations.

Engineering Problem

Engineering Problem advisers will be appointed by the departmental graduate committee. Approval of the topic for the Problem rests with the Problem adviser and the committee.

The Engineering Problem is not a research problem but rather an

engineering problem in depth. It may include elements of design, economics, business management principles, and process development. In general, it will not include laboratory investigations.

Normally, the Engineering Problem will be solved on campus. Under special arrangements approved by the departmental graduate committee and the adviser, a portion of the work may be performed off campus.

Regardless of the arrangements made for the Engineering Problem, no off-campus adviser will be approved. Only the Problem adviser will specify the nature and requirements of the Problem, and the findings and results remain the property of the adviser and the University to be published as they determine.

Language Requirement

There is no foreign language requirement for this degree.

Computer Ability

Ability with computer programming must be demonstrated when required.

Final Oral Examination

This examination is held in accordance with the general graduate school regulations.

industrial engineering and engineering management

The Department of Industrial Engineering offers the following degrees: Master of Science in Industrial Engineering and Master of Science in Engineering Management and Industrial Engineer degree. Degrees can be pursued on a part- or full-time basis and full-time students may elect to participate in the Cooperative Plan. Under the Cooperative Plan a student spends 9-12 months working in a field which is complementary to his academic program and professional goals. During this time he receives compensation from his employer, which is generally in line with salaries for engineers with equivalent experience.

The Master of Science in Industrial Engineering has a General Program as well as majors in Health Systems, Computer and Information Systems, and Operations Research; all of which require a thesis. The Master of Science in Engineering Management has a General Program and majors in Computer and Information Systems and Operations Research. A thesis is not a requirement for this degree. A minimum of 40 quarter hours of graduate level credit is required for either degree program. The Industrial Engineer degree requires 40 quarter hours beyond the M.S. degree. Specific requirements are listed on page 94.

Industrial Intern Program Leading to the MSIE

The Engineering Sponsorship program in Industrial Engineering is known as the Industrial Intern Program. The program, available to a selected group of students, is an enriched MSIE cooperative program in which the student, the University, and a cooperating employer tailor each program to individual interests. Usually the minimum academic requirements of the MSIE program will be substantially surpassed in the industrial intern option.

Through agreements with cooperating employers, students accepted for the industrial intern option will receive full tuition and living expenses for seven or eight quarters. Four of these will be spent in professionally relevant employment. During each of these cooperative quarters, students will take independent study under the direction of a faculty member. Wherever

possible, those specialized reading courses will lead toward a thesis problem statement of interest to the student, cooperative employer and the department. When this goal is achieved, the MSIE program will be completed in seven quarters. A goal of the industrial intern option is that each student's thesis be a significant independent investigation.

Admission to M.S. Programs

To be enrolled for graduate study in Industrial Engineering or Engineering Management, the applicant must have obtained a Bachelor of Science degree in an engineering field, with an acceptable quality of undergraduate work from a recognized college or university. A limited number of applicants with a Bachelor of Science degree in mathematics or a closely related science, whose preparation is considered adequate, may be permitted to pursue either program, and, upon its completion, qualify for the degree of Master of Science without specification.

Entrance to either program presupposes that students have had a basic course in each of the following areas: engineering economy, probability, engineering statistics, operations research (deterministic and stochastic), computer programming (compiler language), and accounting. Recognizing that some applicants may be deficient in certain of these subjects, the program offers the intensive courses listed below. At the time of admission to the program the adviser will specify, on the basis of the applicant's transcript, those courses on the list which the applicant must complete satisfactorily to qualify for the degree. Such specified courses are to be completed as early in the program as scheduling will permit. The courses below carry graduate credit but a maximum of six quarter hours of credit from this group may be used as elective credit toward the degree.

Course		Credits
5.808	Basic Engineering Economy	2
5.810	Industrial Accounting for Engineers	2
5.901	Basic Operations Research I (Deterministic)	2
5.902	Basic Operations Research II (Stochastic)	2
	or	
5.900	Operations Research	4
	Equivalent to 5.901 and 5.902	
5.913	Data Processing for Engineers (FORTRAN)	2
*5.960, 61, 62	Prob. of Statistics I, II, III	6
		16

*Note: As of September 1976 these courses supercede 5.950 and 5.951, Statistics I and II. Students enrolled in the program prior to this date who have not satisfied a requirement of 5.950 and 5.951 should see their advisor to work out equivalent courses and credits.

Industrial Engineering Programs — no specified major

Required Courses

Course		Credit	Quarter
5.803	Industrial Organizations	2	Fall
5.823	Advanced Production Analysis*	4	Fall
5.824	Case Studies in Industrial Engineering	2	Spring
5.909	System Engineering and Analysis	2	Spring
5.914	Advanced O.R.	4	Spring
5.963	Statistics	2	
5.964	Des. of Exp. I	2	
5.992	Seminar	2	Fall
5.991	Thesis	6	All Quarters

The remaining hours are satisfied through a suitable choice of electives at least 6 hours of which will come from one of the five areas of concentration:

Management of Technology
Operations Research and Quantitative Techniques
Production Engineering and Man/Machine Systems
Financial and Operational Controls
Computer and Information Systems

HEALTH SYSTEMS MAJOR

This major is offered on a two-year cooperative basis. Students are expected to spend at least three academic quarters as an intern or resident in training in a health-oriented organization such as a hospital or health planning agency. In addition, the thesis topic must be related to the field of health.

Required Courses

Course		Credit	Quarter
5.823	Advanced Production Analysis*	4	Fall
5.860	Health Care Organization and Management.	2	Fall
5.865	Case Studies in Health Systems	2	Spring
5.909	Systems Engineering and Analysis	2	Winter
5.914	Advanced O.R.	4	Spring
5.963	Statistics	2	
5.991	Thesis	6	All Quarters
5.992	Seminar	2	Fall

The remaining hours should be satisfied through appropriate choice of electives.

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* Not required for students with a degree in Industrial Engineering

ENGINEERING MANAGEMENT

(No specified major)

To assure adequate preparation for management of technological activities, all students who do not elect the Computer Systems or Operations Research major must earn the minimum number of credits indicated in each of the five categories listed below:

Category	Minimum Credits
a. Management of Technology	8 including 5.801
b. Operations Research and Quantitative Techniques	8 including 5.963
c. Production Engineering	4
d. Financial and Operational Controls	4 including 5,830
e. Computer and Information Systems	4
TOTAL	**28**

The remaining 12 quarter hours required for the degree may be considered as free electives. These may be taken within the course offering for this program or from any courses in graduate engineering and mathematics for which the student has adequate preparation. Up to six quarter hours may be elected in other graduate schools subject to the approval of the adviser for this program and the director of the graduate school in which the course is offered. Students desiring courses in such subjects as economics, business law, labor relations, or marketing, should consult the *Graduate School of Business Administration Catalog*. The amount of credit applied toward the degree must be established by the Department.

Courses in the five categories from which students must select to meet the indicated minimum total of 28 quarter hours of credit are listed below. Unless otherwise specified, all courses are for two quarter hours of credit.

a. Management of Technology

5.801 & 5.802 Analysis of the Industrial Enterprise I and II
5.803 Industrial Organizations
5.812 Managing Professional Personnel
5.813 Engineering Communication
5.814 Development of Engineering Managers
5.816 Industrial Psychology for Engineers
5.820 Personnel Administration for Engineers
5.823 Advanced Production Analysis (4 q.h.)
5.841 Engineering Project Management

b. Operations Research & Quantitative Techniques

5.903 Inventory Control and Production Planning
5.904 Queuing Theory and Its Applications
5.905 Analysis with Simulation
5.906, 7 Principles of Dynamic Systems
5.909 Systems Engineering and Analysis

5.911 Linear Programming
5.912 Network Planning and Control
5.914 Advanced Operations Research (4 q.h.) (or 5.9A4, 5.9B4)
5.916 Engineering Analysis Utilizing Data Processing
5.953 Statistical Decision Theory
5.954 Advanced Quality Control
5.956 Mathematical Theory of Reliability
5.957 Designing for Reliability
5.963 Statistics
5.964 Des. of Exp. I
5.965 Des. of Exp. II

c. Production Engineering and Man/Machine Systems

5.806 Production Forecasting
5.817 Advanced Work Design
5.819 Human Factors in Man/Machine Systems
5.822 Product Design and Value Analysis
5.823 Advanced Production Analysis (4 q.h.)
5.825 Topics in Production Engineering
5.853 Man Computer Interaction
5.862 Intro. to Occ. Health, Safety
5.863 Technical Aspects of Health, Safety
5.903 Inventory Control and Production Planning
5.912 Network Planning and Control
5.954 Advanced Quality Control
5.955 Reliability and Maintainability Applications

d. Financial and Operational Controls

5.805 Industrial Budgeting for Engineers
5.809 Advanced Engineering Economy
5.811 Cost Accounting for Engineers
5.830 & 5.831 Financial Management I and II
5.940 Basic Information Systems Technology
5.941 Management Information Systems

e. Computer and Information Systems

5.853 Man Computer Interaction
5.905 Analysis with Simulation
5.906, 5.907 Principles of Dynamic Systems I and II
5.916 Engineering Analysis Utilizing Data Processing
5.930 Basic Computer Systems Technology
5.931 Computer Systems
5.932 Advanced Computer Systems
5.940 Basic Information Systems Technology
5.941 Management Information Systems
5.942 Advanced Management Information Systems

5.943 Management Decision Systems Seminar
3.894 Digital Computer Programming II
3.895 Digital Computer Programming III
3.972 Electronic Digital Computers I
3.973 Electronic Digital Computers II
3.974 Electronic Digital Computers III
3.985 Fundamentals of Automatic Digital Machines I
3.986 Fundamentals of Automatic Digital Machines II
3.987 Fundamentals of Automatic Digital Machines III
3.988 Special Topics in Computer Science
3.989 Computer Peripherals

COMPUTER AND INFORMATION SYSTEMS MAJOR

The Computer and Information Systems (C & IS) Major is designed to meet the needs of three distinct but related professional areas — computer systems, information systems, and management.

A unique two track curriculum offers sets of courses in computer systems and information systems, each track tailored for particular specialties but integrated with material from the other track for general management. The computer system track focuses on basic concepts and their implementation in hardware and software systems. The information systems track focuses on supporting the management decision process — evalution, analysis, and design of management information and decision systems.

The number of courses required from each track depends upon the students professional objectives. Unique programs can be designed in consultation with the adviser. All C & IS majors will be expected to take the ten or sixteen quarter hours of courses listed below as general requirements. In addition they are required to take at least sixteen quarter hours from category (e), computer information systems. It is suggested that students within this major follow one of the two course tracks listed below as a portion of the sixteen quarter hour requirement. Exception to these regulations must be approved in a consultation with an adviser.

General Requirements	**Minimum Credits**
Management of Technology;	
5.801 Analysis of the Ind. Enterprise I	2
Operation Research & Quantitative Techniques	
5.905 Analysis with Simulation	2
5.963 Statistics	2
Production Engineering	
Elective within category	2
Financial Controls	
5.830 Financial Management I	2
Thesis	
5.991 (Required of Industrial Engineering majors)	6
	10 or 16

Two Track Course List

Computer Systems Track

5.930 Basic Computer Systems Technology
5.931 Computer Systems
5.932 Advanced Computer Systems

Information Systems Track

5.940 Basic Information Systems Technology
5.941 Management Information Systems
5.942 Advanced Management Information Systems
5.943 Management Decision Systems

OPERATIONS RESEARCH MAJOR

The following courses are required of students electing the Operating Research major:

		Credits
5.963	Statistics	2
5.801	Analyses of the Industrial Enterprise	2
5.830	Financial Management I	2
5.914	Advanced Operations Research	4
5.991	Thesis (required of Industrial Engineer majors)	6
		10 or 16

In addition to the above required courses, the student must earn the minimum number of credits in each of the categories listed below.

Category	Minimum Credits
b. Quantitative Techniques	8
c. Production Engineering	4
e. Computer Systems	4
Math-oriented courses (listed below)	4
5.910 Analytical Techniques for Engineers	
*10.8B4 Advanced Calculus I	
*10.8B5 Advanced Calculus II	
*10.8B6 Advanced Calculus III	
*10.8G8 Stochastic Processes I	
*10.8G8 Stochastic Processes II	

The remaining hours required for the degree may be considered as free electives. These may be taken within the course offerings for this program or from any courses in graduate engineering or mathematics for which the student has adequate preparation. Up to six quarter hours may be elected in other graduate schools subject to the approval of the adviser for this program and the director of the graduate school in which the course is offered.

*See Graduate School of Arts and Science Catalogue.

THE INDUSTRIAL ENGINEER DEGREE

Description

This degree is designed for those who wish to undertake graduate study beyond the master's degree which is less extensive and more applied than that required for the doctorate. The program leading to the Industrial Engineer degree permits a candidate to pursue a course of study at the upper graduate level which will develop in-depth knowledge in selected Industrial Engineering techniques, and the ability to apply these techniques to complex problems in a real world setting. The offering of this degree is pending approval of the Graduate Council.

Admission

Applicants to the Industrial Engineer Degree program must be enrolled for graduate study in Industrial Engineering or Engineering Management. To be accepted for candidacy for the degree, applicants must possess the master's degree in Industrial Engineering or equivalent from a recognized institution. Further, an applicant for candidacy must have the potential capability to structure and solve complex real-world problems. Evidence of this capability may be in the form of a thesis completed as a requirement for the Master of Science Degree, or in such other form which is acceptable to the Industrial Engineering Department Graduate Committee.

Credit Requirements

A minimum of 40 quarter hours beyond the master's degree is required. Normally 10 quarter hours of credit out of the 40 will be granted for work on the Industrial Engineering Degree project. A minimum of 20 quarter hours must be taken in Industrial Engineering.

Industrial Engineer Degree Project

In addition to the required course work, to be awarded the degree of Industrial Engineer, the candidate must complete a project demonstrating a high level of competence in structuring and solving a complex real-world problem. The problem to be addressed in this project is of an applied nature. Where applicable an on-going organization will be used as the setting. The work should lead to a solution which satisfies all technological and organizational constraints, and is therefore capable of being implemented. The topic will be selected by the student and his project committee.

Qualifications and Examinations

A student must maintain a "B" average to qualify for the degree. A final oral examination for defense of the written report of the Industrial Engineer Degree project conducted by the student's committee is also a requirement for the degree.

Residence Requirement

Since the Industrial Engineer Degree project requires the structuring and solving of a complex problem, residence requirements will be satisfied by that arrangement which allows the student to devote a sufficient portion of his time to the project to permit an intensive problem-solving experience.

graduate program in transportation (interdisciplinary)

Admission

Individuals who have an interest in Transportation Planning and have an undergraduate degree in Engineering or Economics or who have an appropriate mathematics background are permitted to enroll in the Interdisciplinary Transportation Program. Inquiries should be addressed to: Northeastern University Graduate School of Engineering, Interdisciplinary Transportation, 214 Hayden Hall, Boston, Massachusetts 02115.

MASTER OF SCIENCE IN TRANSPORTATION

Northeastern University has established a "Master of Science in Transportation" degree program to deal with the special needs of individuals who are preparing themselves for careers in transportation planning. The individual's program of study will aid the individual to acquire the necessary technical skills and social science background required for a transportation planner. Courses from the Colleges of Engineering, Liberal Arts and Business Administration may be included in the student's program of study. In addition to the in-class training, a student will undertake an independent study project that results in a Master's Thesis or Master's Report. A student will work closely with an advisor on some related problem. Arrangements have been made with local government agencies to involve the students with particular real world problems.

Full-Time Program

The program is arranged in a manner to allow a student to complete the program in one calendar year. Normally, a student will enroll in course work for three academic quarters beginning in September. The student will be eligible for graduation the following September if all course and thesis or report work is complete.

Part-Time Program

The Part-Time Program is the same as the Full-time Program. The part-time student has a maximum of seven years to complete all degree requirements.

Program of Study

Each student enrolled in the program is required to prepare a program of study which consists of required courses and electives in transportation

and related fields. If a student is lacking the necessary mathematics, economics or statistics background, the student may enroll in the prerequisite courses and receive graduate credit. The program of study must consist of a minimum of forty quarter hours of credit and must be approved by the student's advisor.

Required courses		**Credits**
1.834	Transportation Analysis and Planning	4
1.800	Systems Analysis I	4
22.847	Politics of Transportation	3
39.9L5	Economics of Urban Transportation	3
48.801	Seminar in Transportation Systems	3
93.837	Interdisciplinary Urban Transportation Seminar	2
93.820	Thesis	6

Suggested Electives

1.801	Systems Analysis II	4
1.805	Traffic Flow Theory	4
1.806	Urban Transportation Analysis	4
1.819	Environmental Impacts of Urban Transportation	4
1.820	Transportation Engineering	2
5.904	Queuing Theory	2
5.905	Analysis with Simulation	2
5.913	Data Processing (Fortran)	2
5.914	Advanced Operations Research	4
5.818	Management Information Systems	2
21.886	Seminar in Social Research Issues	3
22.845	Problems in Municipal Administration	3
22.846	Problems in Urban and Regional Development	3
39.9K1	Regional Economics	3
39.9L1	Urban Economics I	3
39.9L2	Urban Economics II	3
39.277	Economics of Urban Environment	3
39.276	Economics of Energy Resources	3
39.9L7	Economics of Intercity Transportation	3
39.9R1	Seminar in Development Planning	3
93.818	Special Topics of Transportation	3

Pre-Requisites (Graduate credit awarded toward M.S. in Transportation Degree)

39.9A0	Intermediate Microeconomic Theory	0
1.206	Applied Probability Theory for Civil Engineers	4
	or	
5.960	Engineering Statistics I	2
5.961	Engineering Statistics II	2

description of courses

All courses carry two quarter hours of credit unless otherwise noted. Not all courses are offered every year. Refer to the Graduate School of Engineering circular issued about July 1 each year for the courses to be offered in the new academic year and the times at which they are scheduled to meet.

CIVIL ENGINEERING

1.206 Applied Probability Theory for Civil Engineers (4 q.h. credits)
The basic elements of probability theory and their use via the solution of various civil engineering problems encountered in fluid mechanics, construction management, structures, transportation, etc. Probability of events, random variables and distribution, derived distribution, expectation, and common probability models. *Prep. Admission to Graduate School of Engineering.*

1.800 Systems Analysis I (4 q.h. credits)
The use of quantitative techniques to allocate resources in the planning and design of large physical systems encountered in transportation and environmental engineering. Economic analysis of alternatives; development of mathematical models; classical optimization techniques by calculus; linear programming and extensions; integer, quadratic, separable and approximation programming methods; ranging analysis; network theory. *Prep. Two semesters of calculus.*
Offered yearly, fall quarter, days

1.801 Systems Analysis II (4 q.h. credits)
Additional quantitative techniques for planning and design. Treatment of multi-objective systems; dynamic and geometric programming; decision analysis for selection; utility theory; Markov chains; gaming; introduction to simulation. *Prep. 1.800, Systems Analysis I.* Offered yearly, winter quarter, days.

1.803 Traffic Flow Theory I
Statistical methods in traffic flow theory; probability models, hypothesis testing and its use, queuing theory and simulation techniques. *Prep. 5.950, Engineering Statistics I or equivalent.* Offered 1977-78, fall quarter

1.804 Traffic Flow Theory II
Deterministic methods in traffic flow theory; car following models; various methods of analogy, capacity and level of service. *Prep. 1.803, Traffic Flow Theory I.*
Offered 1977-78, winter quarter

1.805 Traffic Flow Theory (4 q.h. credits)
This course, offered days, embodies the material in 1.803 and 1.804, Traffic Flow Theory I and II. *Prep. 5.950, Engineering Statistics I or equivalent.*
Offered yearly, winter quarter

1.806 Urban Transportation Analysis (4 q.h. credits)
Principles of the analysis of urban transportation networks utilizing contemporary methodology such as cross-elasticity models, disaggregate-behavioral (probabalistic) models, and network equilibrium concepts. *Prep. 1.834, Transportation Analysis and Planning.* Offered yearly, winter quarter.

1.819 Environmental Impacts of Urban Transportation (4 q.h. credits)
Examination of the human response to noise, water and air pollution; physical effects of pollution in relation to source-receptor configurations and urban scale meteorology; laboratory and field techniques used in measuring pollutant levels; government regulations and guidelines and their effect on urban transportation planning. *Prep. Admission to Graduate School of Engineering.*

1.820 Transportation Engineering (2 q.h. credits)
Description and evaluation of different modes of transportation existing and proposed; their performance and cost characteristics; design, performance, and selection criteria for vehicles and roadbeds. *Prep. Admission to Graduate School of Engineering.*

1.824 Civil Engineering Materials I (2 q.h. credits)
The behavior of civil engineering materials subjected to various loading and environmental conditions. Includes atomic structure and bonding, elastic and plastic behavior of metals, strength and durability of wood, concrete, and bituminous mixes.

1.825 Civil Engineering Materials II (2 q.h. credits)
Continuation of 1.824. Includes composite materials, phase transformations, corrosion, strengthening mechanisms.

1.834 Transportation Analysis and Planning (4 q.h. credits)
Principles of the analysis of transportation networks, through the use of the conventional forecasting model system, including trip generation, trip distribution, modal split and traffic assignment. Offered yearly, fall and winter quarter

1.837 Interdisciplinary Urban Transportation Seminar
Review and presentation of research and public policy on broad topics in transportation. Guest lecturers and formal paper presentations. *Prep. Permission of Civil Engineering Department.*

1.838 Master's Report (Transportation) (4 q.h. credits)
An individual effort in an area selected by student and adviser resulting in a definitive report. *Prep. Permission of the Civil Engineering Department.*
Offered yearly, all quarters

1.839 Thesis (Master's Degree) (6 q.h. credits)
Analytical and/or experimental work conducted by arrangement with and under the supervision of the department. *Prep. Permission of the Civil Engineering Department.* Offered yearly, all quarters

1.841 Structural Analysis I
Review of basic principles of structural analysis, determinacy, indeterminacy, stability. Introduction to energy methods including virtual work and Castigliano's Theorum. *Prep. Differential and Integral Calculus plus Theory of Structures.*
Offered yearly, fall quarter

1.842 Structural Analysis II
Contemporary methods of structural analysis with emphasis on lateral load analysis of multistory structures. A complete treatment of moment distribution including nonprismatic members, axial load, and shear distribution. *Prep. 1.841 Structural Analysis I.* Offered yearly, winter quarter

1.843 Structural Analysis III
Introduction to matrix methods of structural analysis, including stiffness and flexibility methods. *Prep. 1.842, Structural Analysis II.* Offered yearly, spring quarter

1.844 Structural Analysis IV
Introduction to advanced structural mechanics, emphasis on theory of elasticity, and development of finite element method of analysis. *Prep. 1.843 Structural Analysis III.*
Offered 1977-78, fall quarter

1.847 Structural Analysis (4 q.h. credits)
This course, offered days, embodies the material in 1.841 and 1.842 — Structural Analysis I and II. *Prep. Differential and Integral Calculus plus Theory of Structures.* Offered yearly, fall quarter

1.849 Model Analysis
Development of the principles of similitude to establish the relationship between behavior in the model and the full-sized structure. Review of techniques to fabricate, to load, and to instrument models. Application and use of strain gauges. The laboratory portion is devoted to model analysis of a complex structure. *Prep. Admission to program and approval of instructor.* Offered 1977-78, spring quarter

1.850 Structural Dynamics I
Analysis by exact and approximate methods of structures subjected to dynamic loads. Offered 1977-78, winter quarter

1.851 Structural Dynamics II
Continuation of 1.850 with application to the analysis of structures subjected to blast loads and seismic loadings. *Prep. 1.850, Structural Dynamics I.*
Offered 1977-78, spring quarter

1.853 Concrete Structures I
Review of basic characteristics of concrete. Structural forms appropriate for reinforced and prestressed concrete. Prestressed concrete design. *Prep. Undergraduate Reinforced Concrete Design and Structural Analysis.*
Offered yearly, fall quarter

1.854 Concrete Structures II
Continuation of Concrete I. Additional topics on prestressed concrete design, yield line theory, and folded plate design. *Prep. Undergraduate Reinforced Concrete Design and Structural Analysis.* Offered yearly, winter quarter

1.855 Concrete Structures III
Analysis and design of thin-shell concrete structures including domes, cylindrical shells, and hyperbolic paraboloids. *Prep. Undergraduate Reinforced Concrete Design and Structural Analysis.* Offered yearly, spring quarter

1.856 Structural Analysis (4 q.h. credits)
This course, offered days, embodies the course content offered in 1.843, Structural Analysis III and 1.844, Structural Analysis IV. *Prep. 1.847, Structural Analysis.*
By arrangement

1.857 Structural Dynamics (4 q.h. credits)
This course, offered days, embodies the material in 1.850 and 1.851 — Structural Dynamics I and II. Offered yearly, spring quarter

1.858 Concrete Structures (4 q.h. credits)
This course, offered days, embodies the material in 1.853 and 1.854 — Concrete Structures I and II. *Prep. Undergraduate Reinforced Concrete Design and Structural Analysis.* By arrangement

1.859 Structural Stability
Elastic and inelastic stability of structures including beams, columns, plates, and shells. Offered 1976-77, fall quarter

1.861 Design of Structures I
An advanced course in elastic design in structural steel. Design problems involving braced and rigid frame structures subject to gravity, wind, and seismic loads are considered. *Prep. Undergraduate Steel Design and Structural Analysis*
Offered yearly, fall quarter

1.862 Design of Structures II
An advanced course in analysis and design in structural steel with emphasis on plastic behavior including rigid frame buildings and braced multistory frame buildings. *Prep. Undergraduate Steel Design and Structural Analysis.*
Offered yearly, winter quarter

1.863 Design of Structures III
Advanced problems in elastic and plastic design of structural steel. Topics include curved girders and cable supported structures. *Prep. Undergraduate Steel Design and Structural Analysis.* Offered yearly, spring quarter

1.864 Design of Structures (4 q.h. credits)
This course, offered days, embodies the material in 1.862 and 1.863 — Design of Structures II and III. *Prep. Undergraduate Steel Design and Structural Analysis.*
By arrangement

1.871 Engineering Properties of Soils I
Review of phase relationships, soil consistency, etc.; permeability and capillarity; effective stress concept, analysis of seepage in porous media; stress distribution; introduction to settlement analysis. *Prep. Undergraduate course in basic soil mechanics.* Offered yearly, fall quarter

1.872 Engineering Properties of Soils II
A continuation of course 1.871. The course covers consolidation theory and settlement analysis; shear strength properties of soils; stability analysis of open and braced cuts; and earth pressure theory and analysis. *Prep. 1.871, Engineering Properties of Soils I.* Offered yearly, winter quarter

1.873 Soils Testing Laboratory
Emphasis on the soil behavior aspects of consolidation theory, settlement analysis, and shear strength. Approximately one-half of the term is devoted to laboratory studies in soil compaction, consolidation, and shear strength. *Prep. 1.871, Engineering Properties of Soils I.* Offered yearly, spring quarter

1.874 Foundation Engineering I
Soil compressibility; case studies of deep-seated settlement; allowable settlements; preloading concepts; bearing capacity; subsurface exploration. *Prep. Undergraduate Soil Mechanics or Foundations.* Offered 1976-77, fall quarter

1.875 Foundation Engineering II
Design principles of footings, mats and floating foundations; pile foundations; selection of foundation scheme; case studies. *Prep. 1.874, Foundation Engineering I.* Offered 1976-77, winter quarter

1.876 Foundation Engineering III
Lateral earth pressure theory; analysis and design of retaining walls, anchored bulkheads and braced cofferdams; dewatering; observational approach to design; foundation performance with case studies; cellular cofferdams. *Prep. 1.875, Foundation Engineering II.* Offered 1976-77, spring quarter

1.877 Engineering Properties of Soil (4 q.h. credits)
This course, offered days, embodies the material in 1.871 and 1.872 — Engineering Properties of Soils I and II. *Prep. Undergraduate course in basic soil mechanics.* Offered yearly, fall quarter

1.878 Foundation Engineering (4 q.h. credits)
This course, offered days, embodies the course content offered in 1.874 and 1.875 — Soil Mechanics and Foundation Engineering I and II. *Prep. Undergraduate Soil Mechanics or Foundations.* Offered yearly, spring quarter

1.882 Engineering Geology
Review of minerals, selected topics in historical and structural geology related to engineering geology; origin and occurrence of various rock types, geologic structures, faulting and joint systems; weathering of rock and weathering products, glaciation, geologic mapping and environmental aspects. *Prep. Undergraduate course in geology.* Offered 1977-78, fall quarter

1.884 Rock Mechanics I
Interrelationship with other disciplines; index properties; classification systems; laboratory tests; state of stress and stress distribution. *Prep. Undergraduate course in geology* Offered 1977-78, winter quarter

1.885 Rock Mechanics II
Behavior of rock under combined stresses; pore pressure effects; failure theories; in-site deformation modulus and shear strength characteristics; field testing. *Prep. Undergraduate course in geology.* Offered 1977-78, spring quarter

1.892 Numerical Methods in Structural Mechanics I
Formulation and numerical solution of civil engineering problems in structural mechanics. Emphasis will be on lumped parameter systems. Equilibrium, eigenvalue, and propagation type problems will be covered.
Offered 1976-77, winter quarter

1.893 Numerical Methods in Structural Mechanics II
Continuation of 1.892. *Prep. 1.892, Numerical Methods in Structural Mechanics I.*
Offered 1976-77, spring quarter

1.894 Numerical Methods in Structural Mechanics (4 q.h. credits)
This course, offered days, embodies the material in 1.892 and 1.893 — Numerical Methods in Structural Mechanics I and II. Offered yearly, winter quarter

1.897 Master's Report (Structural) (4 q.h. credits)
An individual effort consisting of laboratory and/or literature investigation and analysis or advanced design of a project in an area of structural engineering selected by student and adviser resulting in a definitive report. *Prep. Permission of the Civil Engineering Department.* Offered yearly, all quarters

1.898 Special Topics in Structural Engineering (2 q.h. credits)
An individual effort in an area selected by student and adviser resulting in a definitive report. Open to day students only. *Prep. Admission to Graduate School of Engineering.* Offered yearly, all quarters

1.899 Thesis (Master's Degree) (8 q.h. credits)
Analytical and/or experimental work conducted by arrangement with and under supervision of the department. *Prep. Permission of the department.*
Offered yearly, all quarters

1.901 Hydraulics I
Mechanical properties of fluids — fluid statics, continuity, energy relationships (Bernoulli and Euler equations), momentum, dimensional analysis, steady flow in conduits under pressure, pipe systems. *Prep. Undergraduate course in hydraulics.*
Offered yearly, fall quarter

1.902 Hydraulics II
Open channel flow — energy relationships, critical flow, controls, momentum principles, flow resistance, uniform flow, gradually varied flow, local phenomena. *Prep. 1.901, Hydraulics I.* Offered yearly, winter quarter

1.903 Hydraulics III
Open channel flow — channel transitions; unsteady flow; potential flow — velocity potential function and stream function; selected topics in hydraulics and fluid mechanics. *Prep. 1.902, Hydraulics II.* Offered yearly, spring quarter

1.904 Hydraulics (4 q.h. credits)
This course, offered days, embodies substantially the material in 1.902 and 1.903 — Hydraulics II and III. *Prep. Undergraduate course in hydraulics.*
Offered yearly, winter quarter

1.907 Environmental Statistics
Statistical studies applied to environmental data, including basic statistics; frequency and probability distributions; methods of frequency analysis; multiple linear regression and correlation analysis; introduction to mathematical modeling of environmental processes including discussion of deterministic and stochastic processes. *Prep. Admission to Graduate School of Engineering.* Offered yearly, fall quarter

1.908 Hydrology I
Hydrologic cycle; precipitation studies including data adjustment, spatial and temporal variability, intensity-duration-frequency relationships; abstractions of water due to evapotranspiration and infiltration; groundwater flow, including flow nets and well hydraulics; runoff studies including data adjustment, runoff volume, peak flows, unit hydrographs, flood formulas, and drainage design. *Prep. Not to be taken by students who have completed 1.905.* Offered yearly, winter quarter

1.909 Hydrology II
Drainage and river basin morphology; hydrogeology; streamflow and streamflow routing; storage models of runoff; reservoir routing and design; floods and flood control; case studies in hydrology; water law and policy, urbanization and its effects, reservoir system operation and regulation, alternative uses of water resources, and multipurpose projects; conservation and reuse of water. *Prep. Hydrology I. Not to be taken by students who have completed 1.906.* Offered yearly, spring quarter

1.910 Water and Wastewater Treatment I
Water quality, water impurities and effects, the theory and practice of water treatment, and the elements of design of water treatment works including intake facilities, wells, filtration, coagulation, sedimentation, softening, iron and manganese removal, disinfection, and fluoridation. *Prep. 1.921, Environmental Chemistry II, or equivalent.* Offered yearly, fall quarter

1.911 Water and Wastewater Treatment II
Waste characteristics, the theory and practice of wastewater treatment and disposal, and the elements of design of primary and secondary treatment works, including screening, grit removal, sedimentation, biological treatment processes, sludge digestion and disposal, stabilization ponds, and disinfection. *Prep. 1.910, Water and Wastewater Treatment I.* Offered yearly, winter quarter

1.912 Water and Wastewater Treatment III
Salt water conversion, advanced wastewater treatment, and other special problems in water and wastewater characteristics and treatment, including corrosion control, application of chemicals, radioactive wastes, thermal pollution, and treatment plant instrumentation. *Prep. 1.911, Water and Wastewater Treatment II.*
Offered yearly, spring quarter
Offered yearly, winter quarter, days

1.913 Industrial Waste Disposal
Evaluation of industrial waste problems and development of process design for the required treatment facilities; study of various manufacturing processes and their wastewater problems; industrial waste survey techniques; characteristics of industrial wastes; waste reduction methods; physical, chemical, biological, and advanced treatment methods; industrial wastewaters and disposal and treatment of industrial solids and liquids. *Prep. 1.912, Water and Wastewater Treatment III and 1.921, Environmental Chemistry II.* Offered yearly, fall quarter

1.914 Water & Wastewater Treatment (4 q.h. credits)
This course, offered days, embodies the material in 1.910 and 1.911 — Water and Wastewater Treatment I and II. *Prep. Two undergraduate semesters of hydraulics.*
Offered yearly, fall quarter

1.920 Environmental Chemistry I
Analytical chemistry principles are studied with reference to environmental engineering applications. The chemistry of processes such as coagulation, iron and manganese removal, ion exchange, softening, and disinfection are included. The principles of spectroscopy and polarography are also discussed. *Prep. Two semesters of general chemistry.* Offered yearly, fall quarter

1.921 Environmental Chemistry II
A continuation of 1.920 including gas transfer, oxidation and reduction, and radiation chemistry. Reaction rates with reference to environment engineering applications such as BOD are discussed. Topics in organic chemistry and instrumental analysis are included. *Prep. 1.920, Environmental Chemistry I.*
Offered yearly, winter quarter

See NOTE below regarding courses 1.921, 1.922, and courses 1.930, 1.931.

1.922 Environmental Bacteriology
A study of bacteriology with emphasis on environmental engineering applications. The course includes cell structure, nutrition, morphology, growth, reproduction, and metabolism of bacteria. Effects of environmental factors including inhibition, killing, and natural habitats are discussed. Methods of quantitative bacteriology are also covered. *Prep. 1.921, Environmental Chemistry II.* Offered yearly, spring quarter

1.923 Environmental Chemistry (4 q.h. credits)
This course, offered days, embodies the material in 1.920 and 1.921 — Environmental Chemistry I and II. *Prep. Two semesters of general chemistry.*
Offered yearly, fall quarter

1.930 Environmental Analysis I
A laboratory course for the analytical measurement of environmental conditions. Physical, chemical, and biological characteristics are determined by the latest analytical methods with emphasis on their fundamental principles and operational techniques. Interpretation of analytical results for practical applications is also stressed. *Prep. 1.921, Environmental Chemistry II.* Offered yearly, winter quarter

NOTE: It is strongly recommended that this course and 1.931 be taken simultaneously with 1.921 and 1.922.

1.931 Environmental Analysis II
The laboratory analyses are continued with emphasis on the chemical and biological analyses associated with treatment methods; microbiological techniques utilizing microscopy and membrane filter preparation; emphasis on environmental repots. *Prep. 1.930, Environmental Analysis I.* Offered yearly, spring quarter

1.933 Environmental Analysis (4 q.h. credits)
This course, offered days, embodies the material in 1.930 and 1.931 — Environmental Analysis I and II. *Prep. 1.923, Environmental Chemistry taken simultaneously.*
Offered yearly, fall quarter

1.935 Unit Operations in Environmental Engineering I
Laboratory scale unit operations illustrating the physical, chemical and biological principles involved in water and wastewater treatment. The aim is to obtain criteria for system design. Topics include disinfection, water softening, sedimentation, chemical coagulation, and ion exchange. *Prep. 1.931, Environmental Analysis II*
Offered yearly, winter quarter

1.936 Unit Operations in Environmental Engineering II
A continuation of 1.935. Topics include biodegradability studies using activated sludge, anaerobic digestion, vacuum filtration, and chemical-physical process involved in wastewater treatment. A comprehensive evaluation of each unit process is required in a report from each student. *Prep. 1.935, Unit Operations in Environmental Engineering I.* Offered yearly, spring quarter

1.938 Unit Operations in Environmental Engineering (4 q.h. credits)
This course, offered days, embodies the material in 1.935 and 1.936 — Unit Operations in Environmental Engineering. *Prep. 1.933, Environmental Analysis and 1.913, Industrial Waste Disposal.* Offered yearly, spring quarter

1.940 Public Health Engineering Survey
An historical survey of public health conditions to introduce the student to the modern approach to public health engineering problems. Applications of engineering principles to such problems as garbage and refuse disposal, control of insect-borne diseases, milk and food sanitation, rodent control, camp and recreational sanitation, housing, control of atmospheric pollution, and radiological health. *Prep. Admission to Graduate School of Engineering.* Offered by special arrangement

1.945 Solid Waste Management
Basic solid waste management for engineering and science students covering storage, collection practices, sanitary landfill principles, incineration practices and reclamation possibilities. *Prep. Admission to Graduate School of Engineering.*
Offered yearly, fall quarter

1.950 Air Pollution Engineering
Theory and practice related to engineering management of air resources; applications of models for the atmospheric dispersion of pollutants; analysis of control systems for gaseous and particulate emissions utilizing dry collection, wet collection, absorption, and catalytic processes. Discussion of source control evaluation and air quality standards. Course 1.957 is recommended. *Prep. Admission to Graduate School of Engineering.* Offered yearly, fall quarter

1.951 Radiological Health Engineering
Types and sources of radioactive wastes, methods of handling, storage, and disposition of solid, liquid, and gaseous radioactive wastes. Regulatory agency requirements. *Prep. Admission to Graduate School of Engineering.*
Offered by special arrangment

1.952 Industrial Hygiene
Characterization and control of industrial problems associated with noise, heat and ventilation. Physical and biological aspects of environmental stress are discussed. Emphasis is placed on the application of engineering principles to the design of control systems. Evaluation procedures for control effectiveness are reviewed. *Prep. Admission to Graduate School of Engineering.* Offered yearly, spring quarter

1.953 Environmental Microbiology
An advanced course in environmental microbiology. Anaerobic decomposition and eutrophication; transformations of environmental products containing compounds of sulfur, nitrogen, complex hydrocarbons and pesticides. Advanced techniques for the simulation and evaluation of microbiological systems applied to biological control of water and wastewater. *Prep. 1.922, Environmental Bacteriology.*
Offered by special arrangement

1.954 Stream Sanitation
Analysis of the disposal of conservative and non-conservative pollutants in streams. Topics include water quality standards, BOD and oxygen relationships in streams, bacterial pollution, eutrophication, thermal pollution, and general corrective control methods in streams. *Prep. 1.920, Environmental Chemistry I.*
Offered yearly, spring quarter, evenings
Offered yearly, fall quarter, days

1.955 Air Sampling and Analysis
A laboratory course on air pollution measurements utilizing physical, chemical, and instrumental methods and calibration and use of sampling equipment for gaseous and particulate pollutants. Identification and quantitive measurements of pollutants are performed utilizing microscopy, spectrophotometry, gas chromatography, and atomic absorption spectroscopy. *Prep. 1.950, Air Pollution.*
Offered yearly, spring quarter

1.956 Air Pollution Control (4 q.h. credits)
This course, offered days, embodies the material of 1.950, Air Pollution Engineering and 1.955, Air Sampling and Analysis. *Prep. Admission to Graduate School of Engineering.* Offered yearly, winter quarter

1.957 Air Pollution Science
Biological and chemical aspects of air pollution with emphasis on the toxicological aspects of the environment, physiological effects of aerosols, analysis of organic and inorganic constituents of the atmosphere and rationale for establishment of air quality criteria and standards. Note: Course 1.957 is open to non-engineering graduate students as well as engineering graduate students. *Prep. Consent of the department and instructor.* Offered yearly, winter quarter

1.960 Hydraulic Structures I
Dams and associated structures. Design criteria and preliminary analyses for gravity, arch, buttress, rock-fill and earth-fill dams. Foundation treatment and scour protection. Spillway structures. Gates. Navigation requirements of large rivers. Fishways. *Prep. Undergraduate course in hydraulics.* Offered yearly, fall quarter

1.961 Hydraulic Structures II
Intake structures in reservoirs and on rivers. Tunnels and pipe lines: design criteria and structural analyses; economic studies for diameter selection. Penstocks and anchor blocks. Canals — seepage and erosion, linings, canal structures. *Prep. Undergraduate course in hydraulics.* Offered yearly, winter quarter

1.962 Hydraulic Structures III
Surge tanks: selection of type. River regulation: design principles, flood protection and navigation requirements, bank revetments, groins, dikes, and levees. Cofferdams. Operation and maintenance of hydraulic structures. *Prep. Undergraduate course in hydraulics.* Offered yearly, spring quarter

1.970 Design of Environmental Systems (4 q.h. credits)
The development of comprehensive engineering reports. Fundamental design concepts of complete systems for environmental control, including water treatment; wastewater disposal, air quality control, and solid waste disposal; evaluation of economic alternatives for environmental quality control; discussion of actual engineering reports and designs will include considerations of the logic and conclusions. *Prep. 1.912, Water and Wastewater Treatment III.*
Offered yearly, spring quarter, days

1.980 Environmental Planning and Management
Examination of the social, technological, economic, political, legal and institutional aspects of environmental planning and management; environmental impact and assessment considerations related to development projects; environmental planning methodology and techniques. *Prep. Admission to the Graduate School of Engineering.* Offered yearly, fall quarter

1.985 Environmental Protection
Environmental quality and its effects on health, comfort, aesthetics, balance of ecosystems and renewable resources; interaction of the water-land-air complex, vector control, food protection, ionizing radiation, other radiation, and the energies of heat and sound. *Prep. Admission to the Graduate School of Engineering.*
Offered yearly, spring quarter

1.991 Thesis (Master's Degree) (8 q.h. credits)
Analytical and/or experimental work conducted by arrangement with and under the supervision of the department. *Prep. Permission of the Civil Engineering Department.* Offered yearly, all quarters

1.992 Special Topics in Environmental Engineering (2 q.h. credits)
An individual effort in an area selected by student and adviser resulting in a definitive report. *Prep. Permission of the Civil Engineering Department*
Offered yearly, all quarters

1.993 Master's Report Environmental Engineering (4 q.h. credits)
An individual effort consisting of laboratory and/or literature investigation and analysis or advanced design of a project in an area of environmental engineering selected by student and adviser resulting in a definitive report. *Prep. Permission of the Civil Engineering Department.* Offered yearly, all quarters

1.994 Seminar — Environmental Engineering
Discussions by professional engineers and scientists, faculty, and graduate students on subjects in the area of environmental engineering and science. Open to day students only. *Prep. Consent of the instructor.*
Offered by special arrangement, days

1.996 Seminar — Environmental Health
Discussion by professional people in the public health field, faculty, and graduate students on subjects within the area of environmental health. Open to day students only. *Prep. Consent of the instructor.* Offered by special arrangement, days

1.997 Thesis (Ph.D. Degree)
Open to day students only. *Prep. Admission to doctoral program in Environmental Engineering* Offered yearly, all quarters

MECHANICAL ENGINEERING

The courses listed below are of an advanced undergraduate — first year graduate level. A maximum of eight (8) quarter hours of credit from this group of courses may be applied toward the master's degree.

	Course	Credits
2.214	Experimental Stress Analysis	4
2.232	Engineering Materials	4
2.233	Thermodynamics of Propulsion	4
2.235	Statistical Thermodynamics	4
2.236	Nuclear Engineering I	4
2.237	Nuclear Engineering II	4
2.258	Gas Dynamics	4
2.260	Heat and Mass Transfer	4
2.817	Strain Gauge Techniques	2
2.818	Photoelasticity	2
2.847	Dynamics I	2
2.848	Dynamics II	2

The following undergraduate courses which are given in the daytime, may be elected by graduate students for graduate credit subject to the credit hour restrictions listed above.

2.214 Experimental Stress Analysis (4 q.h. credits)
Embodies the material in 2.817, Strain Gauge Techniques and 2.818, Photoelasticity. *Prep. Admission to the Graduate School of Engineering.*
Not offered 1976-77, 1977-78

2.232 Engineering Materials (4 q.h. credits)
Covers thermodynamics of materials; phase equilibria ternary systems; reactions with environment, i.e. kinetics, oxidation, corrosion, etc.; materials design criteria and materials engineering case studies. *Prep. Admission to the Graduate School of Engineering.* Offered spring quarter

2.233 Thermodynamics of Propulsion (4 q.h. credits)
Application of the physical principles of thermodynamics, fluid mechanics and plasmas to the prediction of the behavior of propulsion devices; airbreathing engines and rocket engines with applications to show how physical laws describe and limit performance of particular devices. *Prep. Admission to the Graduate School of Engineering.* Offered 1976-77, fall and winter quarters

2.235 Statistical Thermodynamics (4 q.h. credits)
Statistical thermodynamics approaches the study of thermodynamic equilibrium by regarding a system as a collection of particles to which the principles of either classical or quantum mechanics are presumed to apply; the statistical hypotheses of Boltzmann, Bose-Einstein, and Fermi-Dirac with emphasis on the properties of assemblies of independent particles; applications will be made to the study of gaseous systems, the Einstein and Debye theories of the specific heats of solids and the electron gas in a metal. *Prep. Admission to the Graduate School of Engineering.* Not offered 1976-77, 1977-78

2.236 Nuclear Engineering I (4 q.h. credits)
Study of Nuclear Physics emphasizing atomic and nuclear structure, radioactive decay, and nuclear reactions with particular attention to fusion and fission; health physics, nuclear instrumentation, and the production and uses of radio-active isotopes; comparison of thermal, fast, and breeder reactor types; discussion of neutron interactions and slowing down; four-factor formula and the diffusion equation developed and applied to one-group theory for bare and reflected thermal reactors; energy production and distribution within the core; flux shaping. Not open to students who have completed 2.942, 2.943, and 2.944. *Prep. Admission to the Graduate School of Engineering.* Offered fall and winter quarters

2.237 Nuclear Engineering II (4 q.h. credits)
Development of two-group theory for thermal reactors; the physics and safety of fast reactors; effect of reactivity change, either intentional or accidental, changes due to temperature; fission product buildup, xenon buildup after shutdown, and fuel depletion; reactor design considerations including the interrelationship of reactor physics, reactor engineering (physical design heat transfer, etc.), reactor materials and economics; control and distribution of power; fuel cycle management. Not offered to students who have completed 2.942, 2.943, and 2.944. *Prep. Admission to the Graduate School of Engineering.* Offered spring quarter

2.258 Gas Dynamics
This course continues the study of fluid mechanics with emphasis on compressibility phenomena. The concept of sound speed is introduced and attention is devoted to one-dimensional steady flows. The effects of area change, friction, and heat transfer are considered, including the study of normal shock waves and the behavior of nozzles and diffusers. *Prep. Admission to the Graduate School of Engineering.* Offered spring quarter

2.260 Heat and Mass Transfer (4 q.h. credits)
Review of heat, mass, and momentum transfer analogies; rate equations; conduction problems in steady-state and transient-state for both heat and mass transfer with various constant and fluctuating boundary conditions in rectangular, cylindrical, and spherical coordinates solved by formal mathematics, difference (relaxation) techniques and methods of analogy; thermal stresses induced by non-uniform temperature distributions; heat transfer at high velocity and in rarefied gases; boiling heat transfer at temperature extremes, with forced and natural convection; phase change in bulk stagnant systems. *Prep. Admission to the Graduate School of Engineering.* Offered spring quarter

The following are graduate courses which carry two quarter hours of credit unless otherwise noted. Courses carrying four quarter hours of credit are day courses. Seminar and thesis may have varying credits established by the department at the time of registration. Not all courses are offered every year. Refer to the Graduate School of Engineering circular issued about July 1 each year for the courses to be offered in the new academic year and the times at which they are scheduled to meet.

2.804 Theory of Elasticity I
Analysis of Cartesian tensors using indicial notation. Stress and strain concepts; point stress and strain; relation to tensor concepts. Governing equations for the determination of stress and displacement distributions in an elastic solid. *Prep. Admission to the Graduate School of Engineering.* Offered fall quarter

2.805 Theory of Elasticity II
Exact solutions to the governing equations; plane stress and strain problems in rectangular and polar coordinates including thermal stress; torsion of prismatic and axially symmetric bars; bending of thin flat rectangular and circular plates. *Prep. 2.801, Continuum Mechanics* or *2.804, Theory of Elasticity I.* Offered winter quarter

2.806 Theory of Elasticity III
Approximate solutions for stress and displacement distributions in elastic solids; discrete solutions using finite difference and finite element methods; energy principles and the calculus of variations; relation of energy principles to the finite element method; use of energy principles to obtain approximate continuous solutions. *Prep. 2.805, Theory of Elasticity II.* Offered spring quarter

2.809 Plasticity and Creep
Types of deformation, elasticity, plasticity, creep, mechanical equation of state, plastic flow under multi-axial stress, and elastic creep. Relationship of comparatively simple laboratory material tests to more complex service conditions will be emphasized. *Prep. A recent introductory materials course.*
Offered 1976-77, spring quarter

2.810 Advanced Mechanics of Materials I
Review of fundamental stress and deformation concepts; strain energy density; theories of failure. Theorem of virtual work. Non-symmetrical bending. Introduction to variational techniques with application to beams and frames. *Prep. Admission to the Graduate School of Engineering.* Offered fall quarter

2.811 Advanced Mechanics of Materials II
Analysis of statically indeterminate beams, frames and rings; combined Rayleigh-Ritz Fourier series approach; beams on elastic foundation; stability analysis of beams by exact and approximate methods. *Prep. 2.810, Advanced Mechanics of Materials I.*
Offered winter quarter

2.813 Advanced Mechanics of Materials III
Bending and buckling of thin plates. Introduction to the Finite Element Method. Other selected topics may include simple problems in viscoelasticity and plasticity, depending on class needs. *Prep. 2.811, Advanced Mechanics of Materials II.*
Offered spring quarter

2.815 Plates and Shells
Bending of plates with various shapes, loads, and supports. Large deflection of plates. Membrane theory of shells. Analysis of cylindrical shells. General theory of thin elastic shells. Shells of revolution. *Prep. 2.806, Theory of Elasticity.*
Offered 1977-78, spring quarter

2.817 Strain Gauge Techniques
Theory and application of mechanical and electrical strain gauges. Installation, instrumentation, and circuitry of gauge set-ups for transducer use and experimental stress analysis. Use of brittle coatings in experimental stress analysis. *Prep. Admission to Graduate School of Engineering. See course 2.214.*
Not offered 1976-77, 1977-78

2.818 Photoelasticity
Theory and practice of photoelastic methods as applied to classical experimental stress analysis of models and as modified for use in photoelastic coatings. *Prep. Admission to Graduate School of Engineering. See course 2.214.*
Not offered 1976-77, 1977-78

2.819 Fluid Dynamics I
Discussion of a number of kinematic concepts important in the area of fluid dynamics including deformation rate, vorticity, circulation, and the equation of continuity. *Prep. Admission to the Graduate School of Engineering.* Offered fall quarter

2.820 Fluid Dynamics II
Description of the state of stress in a fluid; derivation of the Navier-Stokes equation and the energy equation; consideration of appropriate boundary conditions; study of some aspects of inviscid motion. *Prep. 2.819, Fluid Dynamics I.*
Offered winter quarter

2.821 Fluid Dynamics III
Study of viscous fluids of uniform constant density; exact solutions of the governing equations; approximate theories appropriate for flows at low and high Reynolds numbers, respectively. *Prep. 2.820, Fluid Dynamics II.* Offered spring quarter

2.823 Advanced Gas Dynamics
The consequences of fluid compressibility are studied. Shock waves and the theory of characteristics are discussed with specific consideration given to two-dimensional steady flows and one-dimensional unsteady flows. *Prep. 2.820, Fluid Dynamics.*
Offered 1977-78, fall quarter

2.824 Advanced Gas Dynamics
This course continues the subject matter of 2.823. Additional topics may include axially-symmetric steady flow, small-perturbation theory, similarity rules, the hodograph method, or some aspects of physical acoustics. *Prep. 2.823, Advanced Gas Dynamics* Offered 1977-78, winter quarter

2.826 Math. Methods for Mechanical Engineers I
Bessel and Legendre functions; boundary-value problems and series of orthogonal functions. Partial differential equations and applications to heat transfer fluid flow, vibrations and wave propagation. *Prep. Admission to Graduate School of Engineering.* Offered fall & winter quarters

2.827 Math. Methods for Mechanical Engineers II
Functions of a complex variable; Laurent series and singularities; residues and contour integration; conformal mapping and application; introduction to complex transforms. *Prep. Admission to Graduate School of Engineering.*
Offered fall, winter, spring quarters

2.828 Mathematical Methods for Mechanical Engineers III
Matrices and linear equations. Variational calculus and applications. Approximate methods of engineering analysis. Selected topics of current interest. *Prep. 2.826 and 2.827, Math. Methods for Mechanical Engineers I and II.*
Offered 1976-77, spring quarter

2.829 Engineering Fracture Mechanics III
Application of fracture mechanics to fatigue, strain energy density criteria for fracture, arrest criteria. "Work of Fracture" specimen. Application of fracture mechanics to structural analysis. Effect of anisotropy in fracture mechanics. Fracture dynamics, dynamic fracture toughness, strain rate effects. Micro-second fracture phenomenon and criteria, spall, Butcher-Tuler criterion, NAG model. Residual strength, design approaches will be emphasized. *Prep. 2.839, Engineering Fracture Mechanics II.*
Offered 1977-78, spring quarter

2.838 Engineering Fracture Mechanics I
Fundamentals of brittle fracture; theoretical strength, micro/macro fracture characteristic, Inglis-Griffith theory, applicability of same. Linear elastic fracture mechanics; Orewan/Irwin extension to metals, effective surface tension and relation to fracture toughness, plastic zone size correction; geometry effects on fracture toughness; plane strain/plane stress fracture toughness, thickness effects. *Prep. Admission to the Graduate School of Engineering.* Offered fall quarter

2.839 Engineering Fracture Mechanics II
Experimental determination of fracture toughness; slow crack growth "popin", arrest, R-G curves, compliance techniques for determining elastic energy release note. Alternate fracture toughness concepts; resistance curve, crack opening displacement, the J integral. Application of fracture mechanics to fatigue. Design methods to minimize risks of catastrophic failure will be emphasized. *Prep. 2.838, Engineering Fracture Mechanics I.* Offered winter quarter

2.840 Finite Element Analysis Methods
Introduction to the finite element method of numerical analysis; applications in solid mechanics include direct methods, energy approaches and weighted residuals; for-

mulation of simple element stiffness matrices and assembly in one and two dimensions; solids of revolution; brief discussion of complex elements used in large computer programs. Various examples of existing programs to be taken from statics, dynamics, plasticity and heat transfer. *Prep. 2.802, Continuum Mechanics or permission of instructor.* Offered spring quarter

2.841 Vibration Theory and Applications
Modeling of vibratory systems; one degree of freedom systems (determination of equations of motion using free-body and energy methods); forced and free vibrations through two degrees of freedom; Laplace transformation techniques; phase-plane diagrams for undamped forced vibrations and Coulomb damping. *Prep. Admission to the Graduate School of Engineering.* Offered fall quarter

2.842 Vibration Theory and Applications
Multiple degrees of freedom; free and forced vibrations with or without damping, extensional and torsional oscillation, frequency equation, energy methods of solution. *Prep. 2.841, Vibration Theory and Applications or 2.861, Systems Engineering.* Offered winter quarter

2.843 Vibration Theory and Applications
Systems with distributed mass and stiffness; shock and impact; vibrations of beams and related structures; nonlinear and random vibrations. *Prep. 2.842, Vibration Theory and Applications.* Offered spring quarter

2.845 Shock, Vibration, and Noise Control
Theoretical and practical considerations pertinent to the design and protection of structures and equipment subject to severe environments of transient shock, steady state vibration, random vibration, and acoustic noise. *Prep. 2.843, Vibration Theory and Applications.* Offered 1977-78, spring quarter

2.846 Non-Linear Vibrations
Studies of various non-linear problems and the techniques used in solving them. Symmetrical and unsymmetrical systems. The Van der Pol-Kryloff-Bogoliuboff method as well as others will be discussed. *Prep. 2.843, Vibration Theory and Applications.* Offered 1976-77, spring quarter

2.847 Dynamics I
Application of fundamental laws of motion. Transformations of coordinate systems, kinematics of a particle using translating or rotating axis, LaGrange equations, space dynamics. *Prep. Admission to the Graduate School of Engineering.* See course 2.270. Not offered 1976-77, 1977-78

2.848 Dynamics II
Dynamics of rigid bodies, moments of inertia in three dimensions, Euler's Equations, includes gyroscopic motion. *Prep. 2.847, Dynamics I.* See course 2.270.
Not offered 1976-77, 1977-78

2.849 Automatic Control Engineering
Concepts of feedback control; formulation of equations, transfer functions, and block diagrams representing components and systems; linearization; Laplace transformation; stability. *Prep. Admission to the Graduate School of Engineering.*
Offered fall quarter

2.850 Automatic Control Engineering
Study of control action; analysis and design by use of root-locus and frequency-domain techniques. *Prep. 2.849, Automatic Control Engineering.*
Offered winter quarter

2.851 Automatic Control Engineering
Further consideration of linear systems including compensation methods and multiple-inputs. Techniques for the treatment of non-linear systems. *Prep. 2.850, Automatic Control Engineering.* Offered spring quarter

2.853 Fundamentals of Instrumentation
Theoretical principles underlying the design and operation of instruments for measurement and/or control. Analysis of stimulus-response relations. Industrial instruments for measurement and control, including those based on pneumatic and electrical systems. *Prep. Bachelor of Science degree.* Offered fall quarter

2.854 Industrial Process Control
Fundamental principles involved in automatic control of industrial processes. Economic considerations. Application of control instruments to obtain automatic control of temperature, pressure, fluid flow, liquid level, humidity, pH. *Prep. 2.853, Fundamentals of Instrumentation.* Offered winter quarter

2.870 Ocean Engineering I
Extent of the ocean in general with its physical and chemical properties; emphasis on the three-dimensional temperature distribution with time as a variable; the salinity and its variation in oceanic space and time; the density of the ocean and its stability; temperature-salinity relationships and their connection with mixing processes with large water masses; evaporation and water budget of the earth, and ice in the ocean. *Prep. Admission to the Graduate School of Engineering.*
Offered fall quarter

2.871 Ocean Engineering II
Geophysical structure of the sea; forces and their relation to the structure of the ocean; ocean statics, oceanic kinematics; theory of ocean currents in a homogeneous and non-homogeneous ocean; strait currents; effect of wind; the mass field and density current; fundamental principles of oceanic circulation in the troposphere and stratosphere. *Prep. 2.870, Ocean Engineering I.* Offered winter quarter

2.873 Geophysical Engineering
Theory of basic geophysical methods, seismology, magnetics, gravity, and electromagnetic potential relating to ocean research and exploration with emphasis on theory, data processing, computer applications; interpretation of data and their applications; instrument systems; survey procedures; profiling; surface ship systems applications and deep submersible applications. *Prep. Admission to the Graduate School of Engineering.* Not offered 1976-77, 1977-78

2.874 Ocean Measurements
Instrument design; theory application for physical and chemical properties; bathymetry; temperature, velocity and geophysical aspects of seismic, gravity, magnetic, and electromagnetic methods. *Prep. 2.873, Geophysical Engineering.*
Not offered 1976-77, 1977-78

2.901 Advanced Thermodynamics
A critical examination of equilibrium thermodynamics from a rigorous viewpoint emphasizing fundamental concepts including: equilibrium, heat, and work; the first and second law of thermodynamics; energy; heat engines, simple systems, and open systems. *Prep. Admission to the Graduate School of Engineering.*
Offered fall quarter

2.902 Advanced Thermodynamics
Continuation of 2.901 including: examination of temperature scales; entropy and availability; the phase rule, single component systems; thermodynamic relations. Consideration is also given to the ideal gas; chemical potential and thermodynamics of ideal gas mixtures. *Prep. 2.901, Advanced Thermodynamics.*
Offered winter quarter

2.903 Advanced Thermodynamics (4 q.h. credits)
Embodies the material in 2.901 and 2.902 Advanced Thermodynamics. *Prep. Admission to the GraduateSchool of Engineering.* Offered winter quarter

2.904 Special Topics in Advanced Thermodynamics
Selected subjects of current interest in general thermodynamics including: chemical reactions; the law of stable equilibrium, normal and special systems, and the third law. Detailed analysis of the statistics of ensembles is also covered to emphasize the relationship between thermodynamics and statistical mechanics. *Prep. 2.902, Advanced Thermodynamics.* Offered spring quarter

2.905 Cryogenic Engineering
Designed to provide a familiarity with the general field of cryogenics, some of the principal uses of cryogenics, and the ways of obtaining and preserving an environment at a low temperature. Refrigeration, cycle analysis, heat exchanger design, insulation systems, properties of materials, instrumentation problems and applications. Problems will be assigned typical of those which are encountered in the field and laboratory. *Prep. Admission to the Graduate School of Engineering.*
Offered fall quarter

2.906 Cryogenic Engineering
Continuation of 2.905, Cryogenic Engineering. *Prep. 2.905, Cryogenic Engineering.*
Offered winter quarter

2.907 Cryogenic Engineering
Application of Cryogenic Engineering Principles to the design of integrated systems. *Prep. 2.906, Cryogenic Engineering.* Offered spring quarter

2.910 Conduction Heat Transfer
Basic laws of heat transfer; analytical solutions of single and multidimensional systems in steady and transient states with and without heat sources in cartesian, cylindrical, and spherical coordinates; chart solutions; Newtonian method, steady state and transient numerical analysis; generalized fin equation. *Prep. Elements of Heat Transfer.* Offered fall quarter

2.911 Convection Heat Transfer
Fundamentals of convection; Reynolds, Prandtl, and Nusselt numbers; elements of boundary layer theory; free and forced convection in ducts and over flat plates solved

by dimensional, exact mathematical and approximate integral analyses for both laminar and turbulent flows; Reynolds analogy and Prandtl's modification; boiling and condensation; heat transfer in high speed flow; heat exchangers. *Prep. Elements of Heat Transfer.* Offered winter quarter

2.913 Radiation Heat Transfer
Basic laws of thermal radiation; Planck black body radiation; Kirchhoff's laws; Stefan-Boltzmann law; radiation properties of surfaces; radiative transfer between gray and non-gray diffuse and specular surfaces separated by transparent media; radiation properties of gases; radiative transfer through absorbing, emitting, and scattering media; radiative transfer in the presence of conduction and convective heat transfer. *Prep. Elements of Heat Transfer.* Offered spring quarter

2.920 Direct Energy Conversion
The fundamental processes of direct energy conversion and their application to the design and operation of magnetohydrodynamic power generators, thermionic converters, and fuel cells. *Prep. Admission to the Graduate School of Engineering.* Offered 1976-77, fall quarter

2.921 Direct Energy Conversion
Continuation of 2.920. *Prep. 2.920, Direct Energy Conversion.* Offered 1976-77, winter quarter

2.923 Special Topics in Direct Energy Conversion
Irreversible thermodynamics. Unified theory of energy conversion. *Prep. 2.921, Direct Energy Conversion.* Offered 1976-77, spring quarter

2.930 Pumps
Deals mainly with centrifugal pumps, with brief references to other types; flow of fluids in pipes and conduits, system curves, pump head velocity diagrams and head development, efficiency; specific speed, net positive suction head, cavitation; affinity laws, selection of pumps to suit various operating conditions and methods of driving, parallel operation; automatic operation, types of construction and materials used, methods of priming centrifugal pumps, pumping of chemicals, oils, and sludges, special problems of pump installation and operation, water hammer in pump discharge lines. *Prep. Hydraulics.* Offered 1976-77, spring quarter

2.931 Fans and Blowers
Flow of air in pipes and ducts, fan characteristics and laws, various types of fan wheels, inlet and outlet connections, fan capacity control, fan selection and testing. Compression of air and gases, flow in pipes, head-on blowers, performance curves, effect of changes in speed and inlet conditions, construction, regulation, selection, installation, and testing. Axial flow fans and blowers. Positive pressure blowers. *Prep. Thermodynamics.* Offered 1977-78, spring quarter

2.932 Pollution Problems from Combustion Processes I
A major portion of the energy produced in the United States depends upon combustion processes including energy produced in electrical power generation, motor vehicles, and aircraft. Combustion processes have contributed to air, water, and noise pollution problems. This course examines combustion systems in detail to determine sources of pollution problems and to designate methods by which these problems can be met. (Continued on next page)

An overview of the energy production by electrical power generation systems, motor vehicles, and aircraft so that the magnitude of the contribution of these systems to the pollution problem can be assessed. These systems will be described as heat engines. A thermodynamic analysis will be made to evaluate their efficiencies. The correlation between heat engine efficiency and its effect on pollution problems will be discussed. *Prep. Admission to the Graduate School of Engineering.*
Offered 1977-78, fall quarter

2.933 Pollution Problems from Combustion Processes II
Basic principles of combustion processes are developed for an understanding of the emission products as a function of system operating conditions. Topics of thermochemistry, chemical equilibrium, chemical kinetics, conservation of energy, equation of motion, chemistry of hydrocarbons, and theories of combustion processes are presented toward this end. *Prep. 2.932, Pollution Problems from Combustion Processes I.* Offered 1977-78, winter quarter

2.934 Pollution Problems from Combustion Processes III
Combustion systems include physical processes as well as chemical. Physical processes of fuel injection, atomization, vaporization, and mixing, and their relation to combustion systems, will be discussed. Details of operation of electrical power generation systems, automotive engines, and aircraft engines are examined to identify sources of pollution and designate methods for pollution control. *Prep. 2.933, Pollution Problems from Combustion Processes II.* Offered 1977-78, spring quarter

2.935 Power Plant Design
Study of the thermodynamic cycles, equipment, and processes of the various types of power plants, with emphasis on modern central station practice. *Prep. Thermodynamics.* Offered fall quarter

2.936 Power Plant Design
Continuation of 2.935, Power Plant Design. *Prep. 2.935.* Offered winter quarter

2.938 Power Generation Economics
Integrated study of the various factors affecting cost of power generation, including the effects of fuels availability and pricing, equipment selection and plant efficiency, siting and financial considerations. *Prep. 2.935.* Offered spring quarter

2.942 Nuclear Engineering I
Topics include: growth of nuclear power industry; study of nuclear physics emphasizing atomic and nuclear structure, radioactive decay, and nuclear reactions with particular attention to fission and fusion; radiation health physics; principles of shielding; nuclear instrumentation; production and application of radioisotopes; neutron interactions and slowing down theory; neutron activation analysis. (Not open to students who have completed 2.236 & 2.237.) *Prep. Admission to Graduate School of Engineering.* Offered fall quarter

2.943 Nuclear Engineering II
Comparison of thermal, fast, and breeder reactors; four factor formula and the neutron diffusion equation; one-group, modified one-group, two-group and multigroup theory; bare and reflected thermal reactors; energy production and distribution within core; flux shaping; transient reactor behavior and control; factors affecting

reactivity including temperature, pressure, void formation, fission product accumulation, fuel depletion and fuel breeding; Xenon buildup after shutdown. (Not open to students who have completed 2.236 & 2.237.) *Prep. 2.942.* Offered winter quarter

2.944 Nuclear Engineering III
Reactor design considerations; interrelationship of reactor physics, control, engineering, materials, safety, and fuel cycle management; reactor types; radiation damage and reactor materials; nuclear fuels; reactor heat transfer; economics of nuclear power; environmental effects. (Not open to students who have completed 2.236 & 2.237.) *Prep. 2.943.* Offered spring quarter

2.953 Advanced Physical Metallurgy III
The kinetics of phase transformations in metals. Topics include kinetic theory, empirical kinetics, diffusion in metals, nucleation, diffusional growth, martensitic transformations. *Prep. A recent introductory material science course.*
Offered 1976-77, spring quarter

2.954 Advanced Physical Metallurgy I
Dislocation theory; including such topics as dislocation stress fields, self energy, velocity, interactions mechanisms, image forces, and theories of yielding. *Prep. A recent introductory material science course.* Offered 1976-77, fall quarter

2.956 Advanced Physical Metallurgy II
Mechanical behavior of metals. Application of dislocation theory to micro-plasticity, strain hardening, strengthening mechanisms and creep. *Prep. 2.954, Advanced Physical Metallurgy I.* Offered 1976-77, winter quarter

2.960 Thermodynamics of Materials I
Basic metallurgical thermodynamics encompassing first, second, and third laws, entropy, enthalpy, and free energy. *Prep. Engineering Materials.*
Offered 1977-78, fall quarter

2.961 Thermodynamics of Materials II
Continuation of 2.960 with emphasis on solutions, activity, activity coefficients, the phase rule and applications to some metallurgical problems. *Prep. 2.960, Thermodynamics of Materials I.* Offered 1977-78, winter quarter

2.963 Thermodynamics of Materials III
The application of metallurgical thermodynamics to various process metallurgical problems, i.e., gas-solid systems, etc., plus kinetics of reactions and dynamics systems analysis. *Prep. 2.960 or 2.961, Thermodynamics of Materials I or II.*
Offered 1977-78, spring quarter

2.965 Physical Ceramics
Introduction to ceramic fabrication processes. Characteristic of vitreous and crystalline solids, structural imperfections, and atomic mobility. Phase equilibria, nucleation, crystal growth, solid-state reactions, non-equilibrium phases, and effects on the resulting microstructure of ceramics. *Prep. A recent introductory material science course, Physical Chemistry or Solid State Physics.*
Offered 1976-77, fall quarter

2.966 Physical Ceramics
Discussion of effects of composition and microstructure on the thermal, mechanical, optical, electrical, and magnetic properties of ceramic materials. *Prep. 2.965, Physical Ceramics* Offered 1976-77, winter quarter

2.970 Material Science and Engineering I
Principles underlying the structure and properties of solid materials. The relationships of these principles to the properties and to applications in structures and devices. Both macroscopic-phenomenological and electronic-molecular approaches will be used. Materials will include metals and alloys, semiconductors, and dielectrics. Typical subjects are atomic and electronic structures, ordering, nucleation, crystal growth, and thermal properties. *Prep. A recent introductory material science course.* Offered 1977-78, fall quarter

2.971 Material Science and Engineering II
Continuation of 2.970 into additional topics such as thermal, electric, magnetic, and optical properties; applications of solid-state phenomena to achieve functions embodied in transducers, filters, amplifiers, energy converters, and so forth. *Prep. 2.970, Material Science and Engineering.* Offered 1977-78, winter quarter

2.972 Materials Science and Engineering III
Continuation of 2.971 plus a discussion of various special topics that will vary from year to year. Examples are: metastable phases and thin films. *Prep. 2.971, Materials Science and Engineering II.* Offered 1977-78, spring quarter

2.975 Introduction to Diffraction Methods in Materials Science
General principles of the diffraction of short wave length radiations; such as x-ray, electrons, and thermal neutrons by materials are studied with emphasis on the understanding of the similarities and differences of the different radiations when applied to the study of the structures of crystalline and non-crystalline materials. *Prep. A recent introductory material science course.* Offered 1977-78, fall quarter

2.976 Diffraction Methods in Materials Science
Continuation of 2.975 with emphasis on the experimental methods and applications. This includes: choice of radiation, introduction to instrumentation, sample preparation, methods of detection and recording of the diffracted radiation, analysis, interpretation and use of the results. *Prep. 2.975, Introduction to Diffraction Methods in Materials Science.* Offered 1977-78, winter quarter

2.982 Metallurgical Systems for Structural Applications I
Several important metallurgical and material systems are studied with emphasis on categorizing their utility and explaining sources of their strength, fracture toughness, fatigue strength and creep resistance. This course deals in a general way with the metallurgical and mechanical aspects of the properties listed. *Prep. An undergraduate materials science or metallurgy course.* Offered 1977-78, winter quarter

2.983 Metallurgical Systems for Structural Applications II
The application of the principles developed in 2.982 to the following specific metallurgical and materials systems: high strength steels, aluminum alloys, titanium alloys, superalloys, polymeric materials, ceramic materials, fiber composites. *Prep. 2.982, Metallurgical Systems for Structural Applications I.*
Offered 1977-78, spring quarter

2.985 Powder Metallurgy
Powder characteristics and methods of manufacture. Powder pressing: packing, interparticle bonding, effects of pressure. Principles of sintering. Characteristics and properties of products made from powdered materials. *Prep. A recent introductory material science course.* Offered 1976-77, spring quarter

2.986 Behavior of Materials Under High Pressures I
Historical development of high pressure research in brief. Basic design principles of static high pressure apparatus; use of gases, liquids and solids as pressure transmitting media; introduction to principles of shock wave method; equations of state of solids and their measurement at high pressures and at ultra high pressures. *Prep. Admission to the Graduate School of Engineering.* Offered 1976-77, fall quarter

2.987 Behavior of Materials Under High Pressures II
Crystal structure transformation, electronic transitions and insulator-metal transitions under pressure; electrical and magnetic properties and deformations of solids under pressure; geological phenomena related to high pressures; current developments in high pressures. *Prep. 2.986, Behavior of Materials Under High Pressure I.*
Offered 1976-77, winter quarter

2.990 Mechanical Engineering Seminar I (1 q.h. credit)
Introduce first year graduate students to graduate research and the mechanics of undertaking a Master's thesis; research opportunities in the various mechanical engineering disciplines; interdisciplinary research opportunities; definition of a research problem; the role of a thesis advisor; methods of conducting research; writing a Master's thesis. *Prep. Admission to Master of Science Program.*
Offered yearly, fall quarter

2.991 Thesis (Master's Degree)
Analytical and/or experimental work conducted under the auspices of the department. Open to day students only. *Prep. Admission to Master of Science Program.*
Offered yearly, all quarters

2.992 Special Problems in Mechanical Engineering
Theoretical or experimental work under individual faculty supervision. *Prep. Consent of department chairman.* Offered yearly, all quarters

2.993 Special Topics in Mechanical Engineering
Topics of interest to the staff member conducting this class are presented for advanced study. *Prep. Permission of department staff.* Offered yearly, all quarters

2.994 Doctoral Reading
Material approved by the candidate's adviser (only S or F grades will be assigned for this course). *Prep. Passing of Ph.D. Qualifying Exam.* Offered yearly, all quarters

2.995 Dissertation (Ph.D. Degree)
Theoretical and experimental work conducted under the supervision of the department. Open to day students only. *Prep. Admission to the Doctoral Program in Mechanical Engineering.* Offered yearly, all quarters

2.996 Dissertation (Mechanical Engineer Degree)
Analytical and/or experimental work conducted under the auspices of the department. Open to day students only. *Prep. Admission to the Mechanical Engineer Degree Program.* Offered yearly, all quarters

2.998 Mechanical Engineering Seminar II
Graduate students in their final Master's year will present current results of their thesis work. Non-thesis students will present reports on scientific work that they have pursued in the past or have studied in technical literature. *Prep. 2.990, Mechanical Engineering Seminar I.* Offered yearly, winter quarter

ELECTRICAL ENGINEERING

3.800 Plasma Engineering I
Behavior, diagnostics, and generation of plasma and gas discharges; emphasis on the engineering and experimental point of view rather than on a rigorous theoretical treatment. Current literature on a variety of plasma engineering applications will be introduced throughout the course. First quarter topics include: dynamics of charged particles in static electric and magnetic fields, E and M wave-plasma interactions, Infinite and Finite Media, elastic and inelastic collisions. *Prep. Bachelor of Science degree in Electrical Engineering or Physics or 3.977, Precis of Modern Electrical Engineering III.* Fall quarter

3.801 Plasma Engineering II
Plasma Electrodynamics. An introduction to linear and nonlinear response functions. The Fluid Models of plasma are developed and are applied to applications in MHD and stability of various thermonuclear confinement schemes. *Prep. 3.800, Plasma Eng. I.* Fall quarter

3.802 Plasma Engineering III
The Kinetic theory of plasma is developed. Emphasis will be on the collisionless or Vlasov approximations. The theory will be applied to the study of microinstabilities in plasma. *Prep. 3.801, Plasma Eng. II.* Winter quarter

3.803 Plasma Engineering (4 q.h. credits)
Offered days. Includes the material given in 3.800 and 3.801 — Plasma Engineering I and II. *Prep. Bachelor of Science degree in Electrical Engineering or Physics or 3.977, Precis of Modern Electrical Engineering III.* Winter quarter

3.806 Lasers I
Review of basic optical principles and atomic physics; introduction to optical coherence; models for the interaction of electromagnetic radiation with matter; a general description of lasers is given. *Prep. Bachelor of Science degree in Engineering or Science.* Fall quarter

3.807 Lasers II
Laser threshold and rate equations; elementary resonator theory and fabrication; giant pulse operation; specific solid-state, liquid, and gas lasers; and laser systems. *Prep. 3.806, Lasers I.* Winter quarter

3.808 Laser Applications
Applications of lasers and laser systems for a variety of engineering and basic science disciplines; specific laser optoelectronic devices. *Prep. 3.807, Lasers II or equivalent.* Spring quarter

3.810 Thermonuclear Fusion Energetics I
Application of the concepts developed in 3.800 and 3.801 to the problem of thermonuclear plasmas. Emphasis will be on magnetic confinement schemes. Both open (mirror machines) and closed (torroidal confinement machines) systems will be discussed. *Prep. 3.801, Plasma Eng. II.* Fall quarter

3.811 Thermonuclear Fusion Energetics II
Continuation of magnetic confinement schemes. Trapped particle instabilities and anomolous transport effects will be discussed. Introduction to interfial confinement (laser fusion). *Prep. 3.810, Thermonuclear Fusion Energetics I.* Winter quarter

3.812 Thermonuclear Fusion Energetics III
Introduction to Microinstabilities associated with laser fusion devices. Introduction to computer modeling of plasmas. Discussion of recent advances in thermonuclear plasma generation by relativistic electron beams. *Prep. 3.802, Plasma Engineering III; 3.811, Thermonuclear Fusion Energetics II.* Spring quarter

3.817 Physical Acoustics
Radiation, transmission, and absorption phenomena of plane, cylindrical, and spherical waves. Distributed-system analogies, simple sources, dipole sources, radiation impedance, and radiation patterns. Diffraction theory and ray acoustics. The effects of inhomogeneities and of dissipation processes on sound transmission. *Prep. Bachelor of Science degree in Engineering or Science.* Fall quarter

3.818 Aeroacoustics
Theory of acoustic transducers, such as microphones, loudspeakers, and horns. Mechanism of speech production and the acoustic properties of the vocal system. Mechanism of hearing and the acoustic properties of the ear. Noise and noise control in our environment. Room acoustics. *Prep. 3.817, Physical Acoustics.* Winter quarter

3.819 Underwater Sound
Sonar equations. Properties of transducer arrays. Generation, propagation, and reception of underwater sound. The noise background. Detection of signals in noise and reverberation. *Prep. 3.818, Aeroacoustics.* Spring quarter

3.823 Mathematical Methods in Electrical Engineering (4 q.h. credits)
This course, offered days, embodies the material in 3.8C4 and 3.8C5, Mathematical Methods in Electrical Engineering III and IV. (Not open to Northeastern graduates who have completed 3.293). *Prep. Bachelor of Science degree in Engineering.* Fall and winter quarters

3.824 Linear Systems Analysis I (Fundamental Precepts)
A study of the basic concepts of time and frequency domain analysis including differential equations and systems of simultaneous first order equations, integral solutions including superposition and convolution integrals and Green's function solutions; the application of complex variable theory to the study of Laplace and z-

transforms; the application of matrix theory to systems analysis. *Prep. Bachelor of Science degree in Electrical Engineering or 3.975, Precis of Modern Electrical Engineering I. Recommended are courses 3.8C4 and 3.8C5 or their equivalent.*
Fall, winter, and spring quarters

3.825 Linear Systems Analysis II (State Variable Representation of Systems)
A continuation of program begun with 3.824. Introduction to state variable analysis of continuous and discrete systems. Standard canonical representations. Computer simulation of systems behavior. Solution of state equations for linear time invariant systems. Analysis of transient response. *Prep. 3.824, Linear Systems Analysis I or equivalent.*
Fall, winter, and spring quarters

3.826 Linear Systems Analysis III (Applications of State Variable and Transform Techniques)
A continuation of 3.825. Extensions of techniques to time varying systems. Stability and related matters. Introduction to optimization and optimal systems. Observability and controllability. Further applications to discrete as well as continuous systems. The application of digital computers to systems analysis. *Prep. 3.825, Linear Systems Analysis II.*
Winter and spring quarters

3.827 Linear Systems Analysis through State Variable and Transform Techniques (4 q.h. credits)
Offered days. Includes the material given in 3.825 and 3.826, Linear Systems Analysis II and III. *Prep. Bachelor of Science degree in Electrical Engineering and 3.824, Linear Systems Analysis I or equivalent.*
Fall and winter quarters

3.830 Network Synthesis I-A
Matrix circuit analysis including m-port parameter systems. Positive-real functions. Energy functions. Driving-point synthesis techniques for LC, RC, and RL networks. *Prep. Bachelor of Science degree in Electrical Engineering or 3.975, Precis of Modern Electrical Engineering I.*
Fall, winter, and spring quarters

3.831 Network Synthesis I-B
Driving-point synthesis of RLC networks. Properties of two-port networks. Two-port synthesis, including the parallel ladder realization. Lattice synthesis. *Prep. 3.830, Network Synthesis I-A*
Fall, winter, and spring quarters

3.832 Network Synthesis I (4 q.h. credits)
Offered days. Includes the material given in 3.830, Network Synthesis I-A and 3.831, Network Synthesis I-B. *Prep. Bachelor of Science degree in Electrical Engineering or 3.975, Precis of Modern Electrical Engineering I.*
Fall and spring quarters

3.833 Network Synthesis II
Scattering, immittance, and hybrid formalisms for linear networks; state-space formulation and techniques for time-invariant and time-varying networks; introduction to passive n-port synthesis. *Prep. 3.831, Network Synthesis I-B or 3.832, Network Synthesis I.*
Fall quarter

3.834 Advanced Network Theory I
General realizability of linear lumped and distributed systems; synthesis of reciprocal and non-reciprocal n-port networks; lossless microwave multi-port junctions; stabili-

ty characterizations of active networks; theory of linear active multi-port networks. *Prep. 3.833, Network Synthesis II.* Winter quarter

3.835 Advanced Network Theory II
Interrelationship between parts of network functions; theory of optimum broadband matching; approximation methods and insertion loss synthesis; analysis and synthesis of transmission line filters and equalizers; gain-bandwidth theory of negative resistance devices including tunnel diodes, varactors, avalanche transit-time, and bulk-effect devices. *Prep. 3.834, Advanced Network Theory I.* Spring quarter

3.837 Introduction to Graph Theory
Fundamentals of graph theory, including blocks, trees, connectivity, partitions, traversability, line graphs, factorization, coverings, planarity, matrices, digraphs, and enumeration problems. Selected applications of graph theory in such fields as network theory, switching theory, and computer science. *Prep. Bachelor of Science degree in Engineering or Science.* Fall quarter

3.838 Nonlinear Circuit Analysis I
Numerical, graphical, and analytical methods for the solution of physical systems described by nonlinear differential equations. Geometric analysis in second-order systems. Perturbation and averaging theory. *Prep. 3.831, Network Synthesis I-B or 3.832, Network Synthesis I.* Winter quarter

3.839 Nonlinear Circuit Analysis II
Linear, time-varying systems and their relationship to certain nonlinear problems. The WJKB approximation. The Hill and Mathieu Equations. Stability of nonlinear systems. Lyapunov Theory. Selected topics in nonlinear analysis according to group interest. *Prep. 3.838, Nonlinear Circuit Analysis I.* Spring quarter

3.840 Linear Active Circuits I
Active networks are developed from device representation and appropriate circuit theory concepts. Topics included are application of flowgraphs and matrices to design and analysis, development of solid state device models, stability, integrated circuitry limitations and dominant pole analysis, and realization from open and short-circuit impedance concepts. These are applied to the realization, operation, and optimization of gainband-width products of wide-band amplifiers to obtain specific characteristics such as Butterworth and other functions. *Prep. Bachelor of Science degree in Electrical Engineering or 3.967, Precis of Modern Electrical Engineering II.* Fall quarter

3.841 Linear Active Circuits II
The results of 3.840, Linear Active Circuits are extended to include narrowband, band pass amplifiers, and feedback amplifier concepts. The effects of feedback upon gain, impedance noise, and stability are developed from return difference and ratio viewpoints utilizing open and short-circuit loop gain concepts. Consideration is given to the synthesis of driving point and transfer functions using active filters, negative impedance converters, and other basic building blocks. *Prep. 3.840, Linear Active Circuits I.* Winter quarter

3.842 Linear Active Circuits (4 q.h. credits)
Offered days. Includes the material given in 3.840, Linear Active Circuits I and 3.841, Linear Active Circuits II. *Prep. Bachelor of Science degree in Electrical Engineering or 3.976, Precis of Modern Electrical Engineering II.* Fall and winter quarters

3.843 Linear Active Circuits III
A continuation of the material covered in Linear Active Circuits I and II. Emphasis will be placed on feedback systems, including multiloop amplifier design. These techniques will be applied to integrated circuit realizations of basic active networks. *Prep. 3.840, Linear Active Circuits I or 3.841, Linear Active Circuits II.* Spring quarter

3.845 Active Network Synthesis
Basic methods of active network synthesis are introduced through three commonly used approaches: feedback amplifier, negative impedance convertor, and gyrator; structures of Sallen and Key, Kuh, Linvill, Yanagisawa, Rohrer, Kinariwals, Sepress, and Calahan; consideration of the practical realization of NIC's and gyrators, standard decomposition methods and sensitivity; work of Sandberg, Larky, Newcomb, Daniels, Horowitz, and Thomas. *Prep. 3.831, Network Synthesis I-B and 3.841, Linear Active Circuits II or equivalent.* Fall quarter

3.853 Solid State Device Theory and Practice (4 q.h. credits)
This course meets twice weekly. On one night there is a two-hour lecture; on the other, a three-hour lab. The course carries four quarter hours of credit.
A case method study of solid state devices with a laboratory tightly integrated with the classroom work. The methodology developed is fundamental to the discrete and integrated circuit technology. The classroom portion of the course is devoted to junction diode and bipolar transistor theory including the physics of achieving a given design. In the laboratory, the student designs, builds, and tests diodes and transistors to meet certain electrical characteristics. The devices achieved are seldom of commercial quality, but sufficient equipment is available in the laboratory to make practical device processing possible even for completely untrained personnel. *Prep. An undergraduate level background in electronics and semiconductor devices.* Fall quarter

3.854 Solid State Theory and Practice (4 q.h. credits)
The course is offered on the same basis as 3.853 and is a continuation of that course. The central topic is field effect transistors with appropriate design problems for the laboratory. *Prep. 3.853, Solid State Device Theory and Practice.* Spring quarter

3.8G1 Characteristics and Models of Solid State Devices I
This sequence of three courses is designed to develop real insight into the operation of a broad range of semiconductor devices. Important topics in the physics of semiconductors to provide the background necessary for device analysis are discussed. Analysis of fundamental building-block units of which devices are made including the PN junction, the ohmic contact and the Schottky barrier. Each is examined under reasonable extremes of bias and temperature to establish the electrical behavior expected from such elementary units. *Prep. Bachelor of Science degree in Electrical Engineering or equivalent.* Fall quarter

3.8G2 Characteristics and Models of Solid State Devices II
Detailed analysis of the bipolar transistor, metal-oxide-semiconductor interface, its influence on the behavior of real junctions, and the various realizations of the field-effect transistor. *Prep. 3.8G1, Characteristics and Models of Solid States I.*
Winter quarter

3.8G3 Characteristics and Models of Solid State Devices III
A continuation of the work of the previous two courses. A detailed analysis of the performance of FET's will permit a critical comparison of field effect and bipolar transistors. Solid state microwave devices; devices that are both unique to microwave applications and the relevant low-frequency elements which require somewhat different analysis at microwave frequencies. An examination of noise in semiconductor devices. *Prep. 3.8G2, Characteristics and Models of Solid State Devices II.*
Spring quarter

3.860 Pulse Processing I
The principles and techniques of pulse-forming and pulse-processing circuits will be developed. Pulse forming, switching and time base generators will be covered. *Prep. Bachelor of Science degree in Electrical Engineering or 3.975, 3.976, and 3.977, Precis of Modern Electrical Engineering I, II, and III.* Winter quarter

3.861 Pulse Processing II
Continuation of 3.860, Pulse Processing I, to include the pulse processing circuits and the analog/digital interface techniques in radar, digital computation and data processing systems. *Prep. 3.860, Pulse Processing I.* Spring quarter

3.865 Radar Systems I
Emphasis on the systems aspects of radar engineering. Topics covered include antennas; low-noise receivers; high-power transmitters; range, angle, and Doppler tracking systems; search radar systems. Mathematical descriptions are used throughout. *Prep. 3.901, Applied Probability and Stochastic Process II or 3.902, Applied Probability and Stochastic Process I.* Fall quarter

3.866 Radar Systems II
Continuation of 3.865, Radar Systems I, a further consideration of systems aspects. The principles of radar detection theory; matched filter and correlation receiver design; radar ambiguity function; radar uncertainty principles; radar waveform synthesis; fundamental accuracy limits; generalized tracking problems. *Prep. 3.865, Radar Systems I.* Winter quarter

3.867 Radar Systems III
Advanced topics in radar engineering including modern tracking techniques, waveform synthesis, multifunction array radar techniques, and selected topics in radar-sensing techniques and devices. *Prep. 3.866, Radar Systems II.*
Spring quarter

3.871 Communications Systems I
Primarily concerned with radio communication systems as used in terrestrial and space communication applications. Antenna gain, space loss, cosmic and atmospheric noise, and receiver noise as factors influencing the signal-to-noise ratio in space and satellite repeater systems; channel models are developed for over the

horizon systems utilizing ionospheric propagation and exhibiting fading and multipaths; contemporary systems are discussed from the standpoint of signal spectrum, noise power and message ambiguity as exhibited at the output of the intermediate frequency receiver. *Prep. Background in probability and Fourier analysis.*
Fall quarter

3.872 Communications Systems II
Primarily concerned with the theoretical aspects of analogue modulation systems used in radio and space communications. First and second threshold effects will be discussed in conjunction with signal-to-noise considerations for amplitude and angle modulated systems. Treatment of frequency feedback and phase-lock loops will be included in the discussion of frequency modulation and detection. Frequency division multiplexing will include sub-carrier pre-emphasis and comparative performance figures for SSSC/FM and FM/FM. *Prep. 3.871, Communications Systems I or 3.900, Applied Probability and Stochastic Processes A.* Winter quarter

3.873 Communications Systems III
Continuation of techniques of 3.872 to cover digital modulation systems and time division multiplexing. Adaptive sampling, aliasing, and interpolation will be discussed along with PAM/FM. Pulse code modulation systems utilizing frequency and phase shifted carriers will be compared under noise conditions. Treatment will be given to the use of codes with special correlation, modulation by sequences, and phase-coherent communication. *Prep. 3.872, Communications Systems II.* Spring quarter

3.875 Electromagnetic Theory I
Maxwell's equations and related electromagnetic laws and relations; basic properties of matter; electromagnetic potentials; the scalar and vector Poisson, D'Alembert, and Helmholtz equations; Green's functions; both mathematical and physical aspects of the theory and their relation to engineering applications. *Prep. Bachelor of Science degree in Electrical Engineering or 3.977, Precis of Modern Electrical Engineering III, Advanced Calculus, and Vector Analysis.* Fall quarter

3.876 Electromagnetic Theory II
Basic radiation phenomenon including retarded potentials, radiation from moving charges, electromagnetic energy, and energy-related theorems. Propagation of plane waves in media with real and complex constitutive parameters. Fundamental theory of guided waves. *Prep. 3.875, Electromagnetic Theory I.* Winter quarter

3.877 Electromagnetic Theory (4 q.h. credits)
Offered days. Includes the material given in 3.875 and 3.876, Electromagnetic Theory I and II. *Prep. Bachelor of Science degree in Electrical Engineering or 3.977, Precis of Modern Electrical Engineering III.* Winter and spring quarters

3.878 Advanced Electromagnetic Theory I
More advanced approaches to problems in electromagnetic theory of interest to electrical engineers — for example: waveguide, antennas, diffraction, and scattering; approximation techniques for obtaining useful solutions of field theory problems including integral equation, perturbation, and variational techniques. *Prep. 3.876, Electromagnetic Theory II or 3.877, Electromagnetic Theory.* Spring quarter

3.879 Advanced Electromagnetic Theory II
Special relativity and relativistic electrodynamics. Radiation from moving charges. Statistical concepts and propagation in random media. Introduction to magneto-hydrodynamics and plasma physics. *Prep. 3.878, Advanced Electromagnetic Theory I*
Fall quarter

3.880 Microwave Theory
Propagation of electromagnetic waves on periodic structures. Propagation on a helix. Waves on electron beams. Coupled-mode theory. Traveling-wave devices. Propagation in anisotropic media. Ferrite devices. *Prep. 3.876, Electromagnetic Theory II or 3.877, Electromagnetic Theory.*
Spring quarter

3.881 Microwave Circuits I
Review of microwave circuit theorems; scattering matrices and applications; eigenvalue problem; symmetrical and miscellaneous junctions; applications of 3-db couplers; polarizers, phase shifters and attenuators; non-reciprocal and ferrite devices. *Prep. 3.876, Electromagnetic Theory II or 3.877, Electromagnetic Theory.*
Winter quarter

3.882 Microwave Circuits II
One-port resonant cavity; transmission cavity; analysis and synthesis of microwave filters; traveling-wave resonators; periodically loaded lines; selected microwave system considerations. *Prep. 3.881, Microwave Circuits I.*
Spring quarter

3.883 Advanced Electromagnetic Theory (4 q.h. credits)
Offered days. Includes the material given in 3.878 and 3.879 — Advanced Electromagnetic Theory I and II. *Prep. 3.876, Electromagnetic Theory II or 3.877, Electromagnetic Theory.*
Spring quarter

3.885 Antennas and Probes in Physical and Biological Materials
Basic theory of electromagnetic radiating structures. The application of antennas as probes to measure the geometrical and electrical properties of physical and biological materials. The use of probes to telemetic information from the human body, the measurement and effect of electromagnetic radiation on humans will be covered. *Prep. 3.876, Electromagnetic Theory II or 3.877, Electromagnetic Theory.*
Spring quarter

3.887 Three-dimensional Picture Processing and Reconstruction
The application of computer and optical methods in finding dimensional information from pictures. Particular attention will be given to transmission pictures that arise from x-ray data, electron micrographs or from electromagnetic scattering. Classical and modern methods will be applied to the problem of making three-dimensional reconstruction from two dimensional pictures. *Prep. Bachelor of Science degree in Engineering or Science.*
Spring quarter

3.890 Electromagnetic Wave Propagation I
Topics in wave propagation of prime importance in communications and space physics. Review of wave propagation in a homogeneous medium. Physical processes in the atmosphere. The formation and structure of the ionosphere. Basic magneto-ionic theory. Propagation of waves in a spatially varying medium. Ray theory. *Prep. 10.9N2, Advanced Mathematics or equivalent.*
Winter quarter

3.891 Electromagnetic Wave Propagation II
Application of the theory of the oblique incidence of radio waves on the ionosphere, including the effects of the presence of the geomagnetic field, to radio communications. The interpretation of ionograms. Path prediction and field strength computations. Absorption. Top side soundings. Incoherent thermal scatter. Ionospheric irregularities and motions, and their study by space and frequency diversity techniques and other methods. *Prep. 3.890, Electromagnetic Wave Propagation I.* Spring quarter

3.893 Digital Computer Programming I
First quarter of a three-quarter sequence of systems programming and language processors. Topics include: machine structure, machine language, assembly language; assemblers, macros, macro-processors; searching and sorting; loaders; data structures, storage allocation; high-level languages; compilers; operating systems; management of memory, processors, devices; multiprocessing and multiprogramming. *Prep. B.S. degree in Engineering or Science and knowledge of a higher level programming lanaguage.* Fall quarter

3.894 Digital Computer Programming II
Continuation of 3.893. *Prep. 3.893, Digital Computer Programming I.*
Winter quarter

3.895 Digital Computer Programming III
Continuation of 3.894. *Prep. 3.894, Digital Computer Programming II.*
Spring quarter

3.898 Combinatorial Mathematics
An introductory course in applied combinatorial mathematics which treats selected topics in enumerative analysis. Particular subjects include permutations, combinations, generating functions, recurrence relations, and the principle of inclusion and exclusion. *Prep. 3.8A1, Mathematical Methods in Computer Science.*
Fall quarter

3.899 Combinatorial Methods and Optimization Techniques
Continuation of 3.898 to cover Polya's theory of counting; selected topics in optimization techniques, which include transport networks, matching theory, linear programming, and an introduction to dynamic programming. *Prep. 3.898, Combinatorial Mathematics.* Winter quarter

3.8A1 Mathematical Methods in Computer Science
Algebraic concepts relevant to computer science; sets, relations, mapping, orderings, algebraic systems, Boolean algebras, groups, rings, finite fields, introduction to vector spaces and linear algebras over finite fields. *Prep. Bachelor of Science degree in Engineering or Science.* Fall & spring quarters

3.8C1 Mathematical Methods in Electrical Engineering I
Complex variable theory; mapping by functions, definite and indefinite integrals, Cauchy integral formula, Laurent series, the residue theorem and branch points. Not open to Northeastern graduates who have completed 3.292. *Prep. Bachelor of Science degree in Engineering or Science.* Fall quarter

3.8C2 Mathematical Methods in Electrical Engineering II
A continuation of 3.8C1 that includes application of complex variable theory to Fourier theory, Hilbert transforms, and conformal transformations in the analysis of linear systems and in electrostatics; the Schwarz-Christoffel transformation, Poisson's integral formula and concept of analytic continuation. *Prep. 3.8C1, Mathematical Methods in Electrical Engineering I.* Winter quarter

3.8C4 Mathematical Methods in Electrical Engineering III
Linear algebraic equations; Gauss algorithm; Linear operators in an n-dimensional vector space over infinite and finite fields; characteristic value problem; minimum polynomial; functions of a matrix; Cayley-Hamilton theorem; Sylvester's identity; matrix transformations: equivalence, congruence, similarity; quadratic forms; definiteness; canonical forms under equivalence and congruence transformation; polynomial matrices. *Prep. Bachelor of Science degree in Electrical Engineering.* Fall quarter

3.8C5 Mathematical Methods in Electrical Engineering IV
Smith normal form; determinantal divisors; invariant factors; elementary divisors; canonical forms under similarity: companion forms and Jordan form; method of Jordan chains; Segre, Ferrer, and Weyr characteristics; decomposition of a vector space into invariant subspaces. *Prep. 3.8C4, Mathematical Methods in Electrical Engineering III* Winter quarter

3.8T0 Numerical Methods and Computer Applications (4 q.h. credits)
This course offered days covers the material in 3.8T1 and 3.8T2, Numerical Methods and Computer Applications, I and II. *Prep. Bachelor of Science degree in Engineering, Mathematics or Physics, a working knowledge of FORTRAN.* Fall quarter

3.8T1 Numerical Methods and Computer Applications I
Survey of numerical methods applied to engineering and scientific problems with emphasis on machine implementation and problem solving; roundoff errors and cumulative errors; difference and summation calculus; roots of polynomials and nonlinear functions; orthogonal functions including polynomials, least squares, and Chebyshev approximation of functions; systems of algebraic equations, matrix notation, and machine implementation; inversion of matrices including iterative methods; sparse matrix techniques. *Prep. Bachelor of Science in Engineering, Mathematics, or Physics; a working knowledge of FORTRAN.* Fall quarter

3.8T2 Numerical Methods and Computer Applications II
Interpolation; numeric quadrature; numeric integration of ordinary differential equations including predictor-corrector methods; stiff dynamic equations, partial differential equations, approximations, boundary value problems. *Prep. 3.8T1, Numerical Methods and Computer Applications I.* Winter Quarter

3.8T3 Numerical Methods and Computer Applications III
Linear and dynamic programming, steepest descent and simplex methods, with application to nonlinear functions in n-dimensional space; eigenvalues and eigenvectors of matrices; approximate location of eigenvalues; stability; Routh-Hurwitz criterion; more specialized techniques including the fast Fourier transform, digital simulation of analog computation, system modelling, etc. *Prep. 3.8T2, Numerical Methods and Computer Applications II.* Spring quarter

3.8T7 Digital Filtering I
Representation of discrete signals and systems; z-transforms and discrete Fourier transforms; difference equations and state space representation of discrete systems; design of digital filters; recursive and nonrecursive. *Prep. 3.824, Linear Systems Analysis I or equivalent.* Fall quarter

3.8T8 Digital Filtering II
Algorithms for fast Fourier transforms, e.g., Cooley-Tukey, Sande-Tukey, etc.; radix two, four and arbitrary algorithms; digital spectra, smoothing techniques, spectral window; effects of quantization truncation and parameter inaccuracies; system performance in the presence of noise; applications to signal processing problems and the solution of partial differential equations. *Prep. 3.8T7, Digital Filtering I or consent of the instructor.* Winter quarter

3.8T9 Digital Filtering (4. q.h. credits)
This course, offered days, embodies the material in 3.8T7 and 3.8T8, Digital Filtering I and II. *Prep. 3.824, Linear Systems Analysis I or equivalent.* Spring quarter

3.9A1 Error Correcting Coding I
Error correcting codes and their decoding techniques which show promise for applications in digital communication, control and computer systems. Emphasis placed on the linear block codes based on algebraic structures; cyclic codes for random error correction (B-C-H codes) and burst error correction. Some knowledge of elementary aspects of modern algebra is desirable but not necessary. Not to be taken by students who have completed 3.904. *Prep. Bachelor of Science degree in Engineering or Science.* Winter quarter

3.9A2 Error Correcting Coding II
Convolutional codes and decoding including the Viterbi algorithm, arithmetic codes. Combination of codes. Coding for ranging and synchronization. Not To Be Taken By Students Who Have Completed 3.908. *Prep. 3.9A1, Error Correcting Coding I or 3.905, Information Theory and Coding.* Spring quarter

3.9C1 Data Transmission I
Deals with the theoretical and practical aspects of digital data transmission in the presence of channel distortion and additive noise. Topics covered in this quarter include the basic binary and M-ary modulation techniques namely, PSK, PAM, FSK, orthogonal and bi-orthogonal signaling, and their performance in an additive Gaussian noise channel; signal design techniques for band limited channels; Nyquist criteria; effect of channel amplitude and delay distortion on performance; and adaptive equalization. *Prep. 3.901, Applied Probability and Stochastic Processes II or 3.902, Applied Probability and Stochastic Processes.* Fall quarter

3.9C2 Data Transmission II
Discussion of several adaptive equalization algorithms for combatting intersymbol interference; maximum likelihood sequence estimation and the Viterbi algorithm; the characterization of fading multipath channels; diversity reception techniques; characterization of atmospheric and man-made (impulsive) noise in radio communications, its effect on error-rate performance; and receiver processing techniques for combatting impulsive noise. *Prep. 3.901, Applied Probability and Stochastic Processes II or 3.902, Applied Probability and Stochastic Processes.*
Winter quarter

The two-part sequence which follows serves to introduce students in engineering and physics to the notions of probability, random variables and stochastic processes. The subject matter is given below.

3.900 Applied Probability and Stochastic Processes I
Introductory probability, sample space and random variables, examples of discrete and continuous probability distribution functions, averages, moments and characteristic function, multivariate distributions, change of variables and functions of variables, central limit theorem, description of stochastic vectors. *Prep. Bachelor of Science degree in Engineering or Science.* Fall, winter, and spring quarters

3.901 Applied Probability and Stochastic Processes II
General concepts of stochastic processes, stationarity and ergodicity, stochastic continuity and differentiation, the Gaussian process, linear systems with stochastic inputs, correlation functions and power spectra, matched filtering, stochastic orthogonality and linear mean-square estimation filtering and prediction. *Prep. 3.900, Applied Probability and Stochastic Processes I.*
Fall, winter, and spring quarters

3.902 Applied Probability and Stochastic Processes (4 q.h. credits)
Includes the material given in 3.900, Applied Probability and Stochastic Processes I and 3.901, Applied Probability and Stochastic Processes II. *Prep. Bachelor of Science degree in Engineering or Science.* Fall, winter, and spring quarters

3.903 Information Theory
Deals principally with three aspects of information theory; the statistical description of sources and the probabilistic measure of their information contents, the determination of channel capacity, and the fundamental coding theorems. *Prep. 3.900, Applied Probability and Stochastic Processes I or 3.902, Applied Probability and Stochastic Processes or Probability.* Fall quarter

3.905 Information Theory and Coding (4 q.h. credits)
Includes the material given in 3.903, Information Theory and 3.904, Error Correcting Coding. *Prep. 3.900, Applied Probability and Stochastic Processes I or 3.902, Applied Probability and Stochastic Processes.* Spring quarter

3.906 Detection and Estimation Theory A
This course presents the classical theory of signal detection and estimation. Particular topics include: likelihood ratio tests for detection of known or random signals; calculation of error probabilities; the signal selection problem; and maximum likelihood estimation of signal parameters. *Prep. 3.901, Applied Probability and Stochastic Processes II or 3.902, Applied Probability and Stochastic Processes.*
Winter quarter

3.907 Detection and Estimation Theory B
This course is a continuation of 3.906 stressing application of the theory. Particular topics include: synthesis of an adaptive receiver; ambiguity function; estimation of angle modulated signals; and selection of features and training algorithms in pattern recognition. *Prep. 3.906, Detection and Estimation Theory A.* Spring quarter

3.908 Special Topics in Communication Theory
Current aspects of communication theory not covered in previous courses. Subject matter may change from year to year. Subjects in 1976-77 and 1977-78 are:

Fall quarter - speech analyses, synthesis and transmission through lecture, directed readings and discussion. Special topics include speech perception, speaker identification and verification, automatic world recognition, computor generated speech, voice response systems and speech transmission and compression operating at data rates between 600 and 6400 bits/second. *Prep. 3.824, Linear System Analysis or equivalent; 3.8T7, Digital Filtering I or equivalent.*

Winter Quarter — Not Offered

Spring Quarter — Applications in Optics
Characterization and processing of optical signals, topics include a Linear System Theory of imaging; the lens as a fourier Transformer; modulation transfer function; phase distortions; film and diode detector noise, coherent (holographic) and incoherent filtering; synthetic apertures; sampled images (a liasma, sampling jitter, noise), digital picture processing (detection, filtering, enhancement); and bandwidth comparison for transmission or storage. *Prep. 3.901, Applied Probability and Stochastic Processes II*

3.909 Detection and Estimation Theory (4 q.h. credits)
Offered days. Includes the material given in 3.906 and 3.907, Detection and Estimation Theory A and B. *Prep. 3.901, Applied Probability and Stochastic Processes II or 3.902, Applied Probability and Stochastic Processes.* Winter quarter

3.910 Nonlinear Systems I
Operators and functionals. Functional power series representation of nonlinear systems. Functional representation of the response of a nonlinear system when its input is either a constant, a sinusoid, a transient. System transforms. Applications to the analysis and synthesis of nonlinear systems in terms of functional power series. *Prep. An undergraduate course in Signals and Systems and 3.900, Applied Probability and Stochastic Processes I or equivalent.* Fall quarter

3.911 Nonlinear Systems II
Nonlinear systems with random inputs. Functional representation of the response of a nonlinear system when its input is a random process. Orthogonal systems of functionals. Representation and analysis of nonlinear systems in terms of orthogonal systems of functionals. The optimum nonlinear filter, predictor, and general operator. Special classes of nonlinear systems. Determination of optimum nonlinear systems for generalized error criteria. *Prep. 3.910, Nonlinear Systems I and either 3.901, Applied Probability and Stochastic Processes II or 3.902, Applied Probability and Stochastic Processes.* Winter quarter

3.912 Nonlinear Systems III
Functional analysis of systems characterized by nonlinear differential equations. Operator approach to system theory and its relationship to differential equation representations. The methods of iteration in nonlinear theory and its application to feedback systems. *Prep. 3.911, Nonlinear Systems II.* Spring quarter

3.913 Optical Storage and Display
Survey of materials and methods for the storage and display of information. Topics included are: photographic film, holograms, storage tubes, magneto-optical films, photochromic materials, electro-optical crystals, evaporated thin films and liquid crystals. *Prep. 3.914, Electro-Optics I or equivalent.* Fall quarter

3.914 Electro-Optics I — Introduction
Introduction to the principles of electro-optical systems; imaging and nonimaging devices. Topics included are: optical imaging, sources, detectors, transmission, absorption scattering, polarization, system evaluation and limitation. *Prep. 10.8A4, Advanced Mathematics or 3.823, Mathematical Methods in Electrical Engineering or equivalent.* Spring quarter

3.915 Electro-Optics II — Imaging Devices
Detailed theory of image formation; evaluation of optical instruments; detailed description of representative systems; test procedures and critical alignment techniques. *Prep. 3.914, Electro-Optics I or equivalent.* Fall quarter

3.916 Fourier Optics I
This two-quarter sequence covers: optical diffraction and imaging problems as linear systems; necessary tools of Fourier Analysis and linear systems analysis which occur when solving the scalar wave equation; waves and their properties; reflection, refraction, polarization, and propagation of waves; foundations of scalar diffraction theory — including Fresnel and Fraunhofer diffraction, interferometry, division of amplitude, division of wavefront, interferometric instrumentation, Fourier transforming, image properties of lenses, coherent and incoherent imaging; and advanced topics in the application of communication theory to optical problems, transfer and spread functions, spatial filtering, and holography. *Prep. 3.915, Electro-Optics II or equivalent.* Winter quarter

3.917 Fourier Optics II
Continuation of 3.916. *Prep. 3.916, Fourier Optics I.* Spring quarter

3.918 Experimental Optics I
Should be taken concurrently with 3.915, Electro-Optics II.
1 hour lecture, 2 hours laboratory. Fall quarter

3.919 Experimental Optics II
Should be taken concurrently with 3.916, Fourier Optics I.
1 hour lecture, 2 hours laboratory. Winter quarter

3.920 Experimental Optics III
Should be taken concurrently with 3.917, Fourier Optics II.
1 hour lecture, 2 hours laboratory. Spring quarter

The laboratory course provides practical experience in experimental optics to supplement the theory developed in the electro- and Fourier optics lectures. Topics include: geometrical properties of lenses, aberrations, and resolution measurements; diffraction effects in optics and in lens systems; interferometric techniques applied to precise optical measurements and to image evaluation. Optical transfer function, spatial optical filtering and Fourier transformation concepts are studied in the laboratory; investigation of holographic techniques and the coherence of light.

3.921 Optical Properties of Matter I — Crystals
Optics of crystals; classification and effects of crystal symmetry on optical properties; classical description of wave propagation in crystals; applications of the theory to modulation, pulse generation, non-linear optics. *Prep. 3.914, Electro-Optics I.* Fall quarter

3.922 Optical Properties of Matter II
Introduction to electro-optical and magneto-optical effects in material media; linear and non-linear optical materials; elasto-optic and acousto-optical materials; polarization and propagation effects; modulation. *Prep. 3.921, Optical Properties of Matter I — Crystals.* Winter quarter

3.923 Optical Properties of Matter III
Thin films and optical fibers; multilayer filters; dichroics; integrated optics. *Prep. 3.922, Optical Properties of Matter II.* Spring quarter

3.924 Advanced Topics in Electro-Optics
Special topics in modern optics and optical techniques requiring the presentation of a paper by participants at termination of the course. *Prep. Consent of the Director of the Electro-Optics Program.* Offered by special arrangement

Additional courses on the optics sequence are 3.980, 3.981, 3.982, 3.983, and 3.984.

3.925 Power Circuit Analysis I
Fundamental concepts of single-phase and polyphase power systems; definitions of terms; use of per unit quantities; equivalent circuits of symmetrical 3-phase systems; introduction to symmetrical components; short circuits on systems with a single power source. *Prep. Bachelor of Science degree in Electrical Engineering.* Fall quarter

3.926 Power Circuit Analysis II
This course is a continuation of 3.925, Power Circuit Analysis I. Sequence impedances of various power-system elements are considered from application point of view; unsymmetrical faults on otherwise symmetrical 3-phase systems; open conductors and asymmetrical connections and loadings; analysis of simultaneous faults on 3-phase systems; 2-phase systems. *Prep. 3.925, Power Circuit Analysis I.* Winter quarter

3.927 Power Circuit Analysis III
This course is a continuation of 3.926, Power Circuit Analysis II. Introduction to Clarke components and applications in analysis of asymmetrical systems and faults; transmission line theory; protective relaying; fundamentals of system stability. *Prep. 3.926, Power Circuit Analysis II.* Spring quarter

3.928 Analysis of Power Systems (4 q.h. credits)
Offered days. This course is designed to provide the basic material, including special mathematical techniques, applicable to the solution of problems associated with power systems. The sequence-impedance characteristics of various power-system elements are investigated with emphasis on application rather than design. Abnormal situations including simultaneous faults and system transients are treated in depth, making use of Clarke components and modified Clarke components as well as symmetrical components. Polyphase transmission line theory, system protection and system stability are introduced and discussed briefly. *Prep. Bachelor of Science degree in Electrical Engineering.* Fall quarter

3.929 Solid State AC and DC Motor Control Systems
The application of solid-state devices to the control of AC and DC electrical machinery, including rectifiers, inverters, choppers and cyclo-converters, as applied

to drive systems in industry and transportation. The course will emphasize a case-method approach. *Prep. A background in electric machinery.* Spring quarter

3.930 Power System Planning
Engineering and economic aspects underlying system development and planning. Probability methods of determining installed and spinning-reserve requirements. Mathematical models of system operation for production-costing studies. Detailed examples include economic comparison of nuclear and fossil-fired plants, the role of pumped-hydro generation, power pooling, and coordinated planning of interconnected systems, and the functions of high-voltage and EHV transmission in planning and operation. *Prep. 3.925, Power Circuit Analysis I.* Spring quarter

3.931 Power System Planning (4 q.h. credits)
Offered days. Includes the material given in 3.930 but with more extensive and in-depth coverage. *Prep. 3.928, Analysis of Power Systems or equivalent.*
Spring quarter

3.932 Power Systems Protection
Consideration of protection applied to generation, transmission, and distribution. Investigation of the characteristics and operating principles of various methods of protective relaying; analysis of current techniques pertaining to system protection. *Prep. 3.927, Power Circuit Analysis III or equivalent.* Fall quarter

3.933 Power System Transients
Transients in power systems due to system switching, lightning, or faults. Traveling-wave phenomena; insulation coordination; overvoltages due to disturbances on the system; surge protection. *Prep. 3.927, Power Circuit Analysis III or equivalent.*
Winter quarter

3.935 Computers in Power Systems I
Techniques used in solving power system problems with the digital computer. Matrix formulations are examined, followed by a detailed treatment of the short-circuit problem, including balanced and unbalanced faults. Various iterative techniques are studied for the solution of the power-flow problem. *Prep. Bachelor of Science degree in Electrical Engineering or equivalent.* Fall quarter

3.936 Computers in Power Systems II
Practical considerations of solving large scale networks are discussed. Network reductions, distribution factors and contingency analysis techniques are developed. Digital models for regulated generators, fixed and load tap changing transformers and HVDC transmission lines are examined. Computer methods for economic dispatch, loss coefficients and application of pumped hydro are developed. *Prep. 3.935, Computers in Power Systems I.* Winter quarter

3.937 Computers in Power Systems III
Computer methods for solving differential equations for application to transient stability problems are examined in detail. Approximate stability models are developed. Introduction to online state estimation, examination of linear estimation models, development of general estimation equations, iterative and direct power system state estimation procedures are discussed. The application of linear programming techniques to power system problems is examined. *Prep. 3.936, Computers in Power Systems II.* Spring quarter

3.938 Computer Control and Analysis of Power Systems (4 q.h. credits)
This course, offered days, combines the evening courses 3.935, 3.936,3.937. *Prep. Bachelor of Science degree in Electrical Engineering or equivalent.* Spring quarter

3.940 Electric Machinery Theory I
Review of Maxwell's Field equations, polyphase electric circuits, magnetic circuits. Transformer equivalent circuit and steady-state operation. Electro-mechanical energy-conversion principles, volt-ampere equations and torque equation for rotating machines. Constructional and winding aspects of rotating machines. Steady-state analysis of synchronous and induction machines. *Prep. Bachelor of Science degree in Electrical Engineering or 3.975, 3.976, and 3.977, Precis of Modern Electrical Engineering I, II, and III.* Fall quarter

3.941 Electric Machinery Theory II
Development of the coupled-circuit equations of the synchronous machine; Park's transformation; per unit systems; the synchronous machine phasor diagram and steady-state analysis *Prep. 3.940, Electric Machinery Theory I or equivalent.* Winter quarter

3.942 Electric Machinery Theory III
Synchronous machine dynamics; analysis of balanced and unbalanced faults; starting and out-of-step operation; protection and control of synchronous machines; analysis of the a-c induction machine. *Prep. 3.941, Electric Machinery Theory II.* Spring quarter

3.943 Advanced Power Laboratory
Offered days. In-depth investigations of the steady-state and dynamic modes of operation of rotating machines. Polyphase rectification and control circuits. Experimentation in other related power areas. *Prep. Bachelor of Science degree in Electrical Engineering.* All quarters

3.944 Special Topics in Power
Offered days. (Part-time students may enroll in this course only by special arrangement.) Directed reading and discussion of topics of special interest in the power field. Series of lectures by guest speakers from industry on topics of particular interest to the power student. *Prep. Permission of instructor.* All quarters

3.945 Power System Transient Stability
Analysis and solutions of the transient stability problem; the swing equation and its solution by numerical methods; the equal area criterion; synchronous machine models; consideration of excitation system reponse, early volving, and independent-pole circuit breakers as they affect stablity. *Prep. 3.927, Power Circuit Analysis III or equivalent.* Fall quarter

3.950 Systems Analysis I-A
Review of probability and statistics. Elements of Markov processes, queuing as a Markov process. Finite and infinite queue systems, multiple-server, parallel and sequential queuing; fundamentals of reliability theory. *Prep. Bachelor of Science degree in Engineering or Science.* Fall quarter

3.951 Systems Analysis I-B
Flow-graph representation of queuing systems, equivalence of flow-graph and analog-computer representation; fundamental concepts in game theory; solution of rectangular games; pure and mixed strategies, maximin and minimax principle; zero and non-zero-sum games, infinite games; transformation of games into linear programming problems. Other methods of solving competitive-situation problems. *Prep. 3.950, Systems Analysis I-A.* Winter quarter

3.952 Systems Analysis II
Modelling of systems problems in terms of linear programming approach. Transportation problem; graphical representation and solution of linear-programming problems; allocation problem; simplex method; concept of duality and its use in linear programming. *Prep. 10.8A4, Advanced Mathematics or 10.9N2, Advanced Mathematics.* Spring quarter

3.953 Systems Analysis III
Optimization of stochastic systems. Markov-process approach to the analysis of probabilistic systems. Z-transform analysis of Markov processes. Solution of sequential decision processes by value and policy iteration. Single-chain and multi-chain systems. Sequential decision processes with discounting. Machinery and car replacement problem, and other applications. *Prep. 3.950, Systems Analysis I-A, 3.952, Systems Analysis II, 10.8G1, Probability or equivalent.* Fall quarter

3.954 Systems Analysis (4 q.h. credits)
Offered days. Includes the material given in 3.950 and 3.951 — Systems Analysis I-A and I-B. *Prep. Bachelor of Science degree in Engineering or Science.*
Spring quarter

3.955 Studies in Electric Power Transmission I
Elements in the design of AC overhead transmission lines; thermal limitations, series and shunt compensation, environmental effects; consideration of transposition, induced effects, and insulation level. Underground alternatives to overhead lines. Elements of distribution. *Prep. 3.927, Power Circuit Analysis III or equivalent.*
Winter quarter

3.956 Studies in Electric Power Transmission II
Fundamental concepts of high voltage DC power transmission; rectifier and invertee performance; regulation; protection; reactive power and filter requirements; practical arrangement of DC lines; the impact of a DC line on overall power system operation. *Prep. 3.927, Power Circuit Analyses III or equivalent.* Spring quarter

3.957 Control System Analysis
Classical analysis techniques for continuous and sampled-data control systems. Discussion of stability criteria; application of root-locus and Bode methods for complementary time and frequency-domain analysis. Consideration of nonlinear systems and development of techniques for stability analysis. Computer simulation of typical control systems will be emphasized. *Prep. Bachelor of Science degree in Engineering; knowledge of transform analysis and some familiarity with FORTRAN.*
Fall quarter

3.958 Control System Synthesis
A review of cascade and feedback compensation techniques with the use of classical criteria for design of continuous and sampled-data control systems. Consideration of the multiple-input problem. A survey of pole-zero synthesis methods, and comparison with other techniques. Computer simulation of design examples. *Prep. 3.957, Control System Analysis or equivalent.* Winter quarter

3.959 Control Systems I (4 q.h. credits)
Includes the material given in 3.957, Control System Analysis and 3.958, Control System Synthesis. Open to qualified undergraduate students. *Prep. Knowledge of transform analysis and some familiarity with FORTRAN.* Fall quarter

3.960 Control System Practice
A further study of control systems with emphasis on the practical aspects of control system design. Discussion of digital compensation and computer-in-the-loop realizations. Consideration of system hardware and software problems. Case studies and a field trip will be included. *Prep. 3.959, Control Systems I or equivalent.* Spring quarter

3.961 Optimal Control Theory
Introduction to optimal control theory with reference to aerospace and process control applications. Variational calculus development of the maximum principle. Numerical solutions using dynamic-programming and steepest-descent algorithms. The optimal linear regulator problem and the matrix Ricatti equation. *Prep. 3.959, Control Systems I or equivalent.* Fall quarter

3.962 Control Systems II (4 q.h. credits)
Includes the material given in 3.960, Control System Practice and 3.961, Optimal Control Theory. *Prep. 3.959, Control Systems I or equivalent.* Winter quarter

3.963 Stochastic Control Theory
Statistical models for random signals; representation of dynamic systems excited by stochastic inputs. Optimal filtering, prediction and smoothing for discrete and continuous systems. Observer theory and feedback of estimated states for effective closed-loop control in a noisy environment. *Prep. 3.900, Applied Probability and Stochastic Processes I or equivalent.* Winter quarter

3.964 Estimation, Identification, and Control
Estimation theory for dynamic systems based on Bayesian and maximum likelihood methods. The system identification problem. Implementation of numerical algorithms for parameter identification and adaptive control. *Prep. 3.963, Stochastic Control Theory.* Spring quarter

3.965 Control Systems III
Includes the material given in 3.963, Stochastic Control Theory and 3.964, Estimation, Identification, and Control. *Prep. 3.900, Applied Probability and Stochastic Processes I or equivalent.* Spring quarter

3.966 Switching Circuits
This course, offered in winter quarter, days, covers the material in 3.967 and 3.968 Switching Circuits I and II. *Prep. 3.8A1 Mathematical Methods in Computer Science.* Winter quarter

3.967 Switching Circuits I
Logical design of combinational switching circuits, including minimization and decomposition of switching functions; multiple output networks; symmetric networks; threshold logic. *Prep. 3.8A1, Mathematical Methods in Computer Science.*
Fall quarter

3.968 Switching Circuits II
Logical design of sequential switching circuits, including the finite-state machine model; iterative networks; capabilities and limitations of finite-state machines; state equivalence; synthesis of asynchronous sequential circuits; state assignment problem and partition theory; machine decomposition. *Prep. 3.967, Switching Circuits I.*
Winter quarter

3.969 Switching Circuits III
Selected topics from the theory of finite automata, possibly including such topics as machine experiments; information lossless machines; linear sequential machines; finite-state recognizers. *Prep. 3.968, Switching Circuits II.*
Spring quarter

3.972 Electronic Digital Computers I
Basic structural aspects and components of a digital computer; coding of digital information; digital arithmetic and algorithms in ninary and complement representations; arithmetic operations, theory of sets, Boolean algebra, truth tables, Karnaugh maps, minimization; combinational logic design using basic logic elements, including NAND, NOR, Exclusive — OR, etc; Flip-flops, clocks, and sequential logic; state diagrams; analysis and synthesis in synchronous sequential logic. *Prep. Bachelor of Science degree in Engineering or Science.*
Fall quarter

3.973 Electronic Digital Computers II
Synchronous sequential logic (cont'd); magnetic and dynamic storage elements; the concept and model layout of a stored-program digital computer; design of an elementary computer including the arithmetic unit, control unit, memory, input/output unit and bus organization, with incorporation of several types of programming instructions that highlight software-hardware interaction; selected topics in digital systems; speed-up arithmetic algorithms. *Prep. 3.972, Electronic Digital Computers I.*
Winter quarter

3.974 Electronic Digital Computers III
The use of hardware description languages such as DDL, CDL, APHL; configuration and description of a computer by micro-operations and micro-statements; machine organization of stored-carry addition using Merce's addition algorithm and of a special purpose computer; introduction to micro-programming and micro-program control concepts; examples in microprogramming; functional and operational organization of CPU memory access, memory stack, associative memory, virtual memory, memory addressing and memory loading; selected tops in control, computer and channel organization; computer design simulation techniques in CDL. *Prep. 3.973, Electronic Digital Computers II.*
Spring quarter

3.975 Precis of Modern Electrical Engineering I
Prep. Bachelor of Science degree in Engineering or Science plus knowledge of matrix algebra.
Fall quarter

3.976 Precis of Modern Electrical Engineering II
Prep. Bachelor of Science degree in Engineering or Science. Winter quarter

3.977 Precis of Modern Electrical Engineering III
Prep. Bachelor of Science degree in Engineering or Science. Spring quarter

3.978 Precis of Modern Electrical Engineering IV
Prep. Bachelor of Science degree in Electrical Engineering or Science.
Spring quarter

The preceding four precis courses are intended primarily for those whose undergraduate major was in an engineering or scientific field other than electrical engineering. They are also recommended for students 5 to 10 years away from their bachelor's degree in electrical engineering who feel the need for a review of electrical science. They are open only to students in these categories. The material is basically undergraduate in nature but the viewpoint and depth are at the mature level appropriate to graduate students. Part I deals with the theory of electric circuits and linear systems, Part II with electronics, Part III with field theory from the engineering viewpoint, and Part IV with communication theory especially spectral analysis correlation and modulation.

3.979 Electronic Digital Computers (4 q.h. credits)
This course, offered days, embodies the material in 3.972 and 3.973 — Electronic Digital Computers I and II. *Prep. Bachelor of Science degree in Engineering or Science.* Fall and winter quarters

3.980 Optical Instrumentation Design Concepts
An introduction to the design of optical instrumentation. Principles and basic concepts rather than a rundown of known optical systems. In sequence the topics are: introduction, mechanical shock and vibration, kinematic designs, application of third order aberrations, simple optical ray tracing, optical testing, tolerances, optical instrumentation, philosophy, functional design, design for quantity production, quality assurance, "special order" design, industrial design, examples and exercises. *Prep. 3.915, Electro-Optics II.* Spring quarter

3.981 Principles of Optical Detection I — Application
Laws governing radiation and radiometry; properties of real radiation sources; detailed description of detection devices (image forming and signal generating); noise; contrast and MTF; detection systems (imaging devices and ranging devices); electro-optical detector systems analysis. *Prep. 3.915, Electro-Optics II or equivalent.* Winter quarter

3.982 Principles of Optical Detection II — Theory
Review of detector parameters; statistics of detector noise; practical considerations in real detectors; detection, resolution and recognition of signals; heterodyne detection and parametric amplification; sub-nanosecond pulse detection calibration of electro-optical detectors; detectors as system components. *Prep. 3.981, Principles of Optical Detection I.* Spring quarter

3.983 Fourier Optics III
The third in a series covering current topics of interest in this field and optical instrumentation. Application of coherence phenomena to optical instrumentation such

as microdensitometers, microscopes, viewers, cameras, spectraphotometric and interferometric instruments; applications of holography, optical data processing and computing, holographic memories, optical modulation, noise and its effects on data collection, synthetic aperture optics and medical application of laser optics. *Prep. 3.917, Fourier Optics II.* Fall quarter

3.984 Spectroscopic Instrumentation
Survey of optical instrumentation employed in analysis and control situations; modern methods of spectrometry and interferometry; optimization of analytical systems; topics in electron spectroscopy, X-ray spectroscopy, microwave spectroscopy, and related fields. *Prep. Bachelor of Science degree in Engineering or Science.* Winter quarter

3.985 Fundamentals of Language and Machine Theory I
First of a three-quarter sequence in theoretical models of languages and computation. Topics include: formal grammars, parsing, lexical analysis techniques; syntax-directed translation schemes; regular and context-free languages; finite automata, pushdown automata; more general languages and their corresponding machine recognizers; an introduction to computability theory; solvability and unsolvability; computational complexity considerations. *Prep. 3.8A1, Mathematical Methods in Computer Science.* Fall quarter

3.986 Fundamentals of Language and Machine Theory II
Continuation of 3.985 *Prep. 3.985, Fundamentals of Language and Machine Theory I.* Winter quarter

3.987 Fundamentals of Language and Machine Theory III
Continuation of 3.986 *Prep. 3.986, Fundamentals of Language and Machine Theory II.* Spring quarter

3.988 Special Topics in Computer Science
Aspects of Computer Science not covered in other courses. The subject matter may change from year to year. Fall, winter, and spring quarters

3.989 Computer Peripherals
Survey of various types of modern computer peripherals, systems considerations, displays (CRT; control units, editing features, graphics, etc.); mass storage (magnetic surfaces; flying heads, recording techniques, disks; file organization, search strategies, mass storage, software, etc.); communications terminals (modems, control procedures, store and forward, multiplexers, etc.); tape units (types, consideration of cost vs. performance, tape labels and formats, magnetic recording on tapes, design features, etc.); future trends in peripherals. *Prep. Bachelor of Science degree in Electrical Engineering or related engineering or sciences.* Spring quarter

3.990 Seminar I
A library survey of a selected topic in the general field of electrical engineering with an oral presentation based on this survey. Participation in the departmental seminar program of guest lectures. *Prep. Bachelor of Science degree in Engineering or Science.* Fall and spring quarters

3.991 Seminar II
The preparation of a research paper suitable for publication in a professional journal, plus an oral presentation of this report. *Prep. 3.990, Seminar I.*
Winter and spring quarters

3.993 Doctoral Seminar I
Two hours per week of presentation and discussion of topics at a level compatible with a doctoral program. Subject matter may cover a wide range of scientific and engineering fields. (Only S or F grades will be assigned for this course.) *Prep. Passing of Ph.D. Qualifying Exam.* Fall quarter

3.994 Doctoral Seminar II
Continuation of 3.993, Doctoral Seminar I. (Only S or F grades will be assigned for this course.) *Prep. 3.993, Doctoral Seminar I.* Winter quarter

3.995 Master's Thesis
Analytical and/or experimental work conducted under the auspices of the department. *Prep. Bachelor of Science degree in Engineering or Science.*
Fall, winter, and spring quarters

3.996 Doctoral Thesis
Theoretical and/or experimental work conducted under the auspices of the department. *Prep. Passing of Ph.D. Qualifying Exam.*
Fall, winter, and spring quarters

3.997 Doctoral Reading
Material approved by the candidate's adviser. (Only S or F grades will be assigned for this course.) *Prep. Passing of Ph.D. Qualifying Exam.*
Fall, winter, and spring quarters

3.998 Special Problems in Electrical Engineering
Theoretical or experimental work under individual faculty supervision. *Prep. Consent of dept. chairman.* Fall, winter, and spring quarters

3.999 Electrical Engineer Degree Thesis Research.
Prep. Admission to Engineer Degree Program. Fall, winter, and spring quarters

CHEMICAL ENGINEERING

4.801 Advanced Chemical Engineering Calculations (4 q.h. credits)
The study of complex material and energy balances is undertaken with the view to apply these to actual plant conditions. *Prep. Bachelor of Science degree in Chemical Engineering, including Differential Equations.*

4.802 Special Topics in Chemical Engineering Mathematics (4 q.h. credits)
Formulation and solution of problems involving advanced calculus as they arise in chemical engineering situations. Methods covered will include ordinary differential equations, series solutions, complex variables, Laplace transforms, partial differential equations, and matrix operations. Emphasis will be placed on methods for formulating the problems. It will be assumed that the student has been exposed to some of these topics in appropriate mathematics courses. *Prep. 10.147, Mathematical Analysis or equivalent.* Offered yearly, fall quarter

4.803 Numerical Techniques in Chemical Engineering (4 q.h. credits)
Digital computer applications to chemical engineering problems. Topics covered include location of roots of linear and non-linear equations, numerical integration, and curve-fitting techniques with emphasis on the numerical solution of ordinary and partial differential equations and to the subject of linear algebra. *Prep. Bachelor of Science degree in Engineering or Science.* Offered yearly, winter quarter

4.806 Optimization Techniques (4 q.h. credits)
Several mathematical optimization techniques are developed and applied to chemical engineering problems. Emphasis on a thorough understanding of a single, representative technique selected from among many within its class. Topics include single variable search (Fibonocicci Search), multi-dimensional search (Pattern Search), linear systems (Linear Programming) and sequential operations (Dynamic Programming). *Prep. Bachelor of Science degree in Engineering or Science.*
Offered yearly, spring quarter

4.811 Special Topics in Chemical Engineering Thermodynamics (4 q.h. credits)
Classical thermodynamics as a method of approach to the analysis of processes of interest to chemical engineers. A study of chemical and phase equilibria involving the various states of matter; prediction and correlation of physical, chemical, and transport properties of gases and liquids; elementary concepts of quantum and statistical mechanics to interpret the empirical properties of classical thermodynamics. Fundamental principles are reviewed to the extent needed. *Prep. Undergraduate Chemical Engineering Thermodynamics.*
Offered yearly, winter quarter

4.812 Chemical Equilibria
This course embodies those elements of 4.811 which are concerned with the thermodynamics of chemical equilibria. Topics covered include auxiliary functions, the conditions of equilibrium, equilibrium of reactions involving gases, and the phase rule as applied to heterogeneous reaction systems. *Prep. Graduate Standing in Chemical Engineering.* Offered 1975-76, spring quarter

4.821 Corrosion Fundamentals
Economic factors basic theories, types, behaviors of specific systems, and protection against corrosion are studied. Wherever possible, engineering applications of the principles are emphasized. *Prep. Bachelor of Science degree.*

4.823 Transport Phenomena (4 q.h. credits)
A consideration of the relationships of mass, momentum, and energy transfer. Fundamental equations of change covering the transport of momentum, heat, and mass are developed to illustrate the essential unity of the transport processes. Molecular, microscopic, and macroscopic systems are studied. It will be seen that much of the theory behind the engineering calculations on which the unit operations of chemical engineering are based can be organized and integrated in terms of equations of change. *Prep. Advanced Mathematics and Unit Operations or equivalent.*
Offered yearly, winter quarter

4.824 Transport Processes
A consideration of the relationships of mass, momentum, and energy transport. Fundamental equations of change for these types of transport are derived and solved for

various chemical and physical systems. Certain transport processes within the human body are also considered. *Prep. Advanced Mathematics or undergraduate Transport Phenomena or permission.* Offered 1975-76, winter quarter

4.825 Sampled-Data Process Control
Signal sampling; z-transformation; pulse transfer functions; open and closed loop systems; stability; frequency and z-domain design methods. *Prep. Undergraduate Process Control or permission.*

4.826 Experiments in Process Control
Laboratory experiments related to controllers, control valves, transmitters, attainment of process dynamics by various methods, and control loop performance are performed and analyzed. *Prep. Undergraduate Process Control or permission.*

4.827 Chemical Process Control I
Review of classical control techniques; state variable representation and analysis of continuous systems with applications to process control. *Prep. Undergraduate Process Control or permission.*

4.828 Chemical Process Control II
Frequency domain process dynamics and control system analysis; feedforward and cascade control applications; associated papers from the chemical engineering literature. *Prep. 4.827, Chemical Process Control I or permission.*

4.829 Special Topics in Chemical Process Control (4 q.h. credits)
Review of classical control techniques; state variable representation and analysis of continuous systems with applications to process control. Frequency domain process dynamics and control system analysis; feedforward and cascade control applications; associated papers from the chemical engineering literature. *Prep. Undergraduate Process Control or permission.*

4.830 Advanced Topics in Chemical Process Control (4 q.h. credits)
Topics related to the analysis and synthesis of sampled-data process control systems; associated papers from the chemical engineering literature. *Prep. 4.829, Special Topics in Chemical Process Control or permission.*

4.832 Chemical Data Estimation
Methods of obtaining physical and thermodynamic properties of chemical compounds and systems without resorting to laboratory investigation. Latest empirical relationships and physical and thermodynamic laws are introduced to obtain data for plant design and other chemical and engineering uses. *Prep. Bachelor of Science degree.*

4.833 Research Techniques I (4 q.h. credits)
The essential techniques of research including experimentation, mathematical modeling, data reduction, and graphical presentation techniques. For students in the non-research options (M.S. and D.Eng.). *Prep. Bachelor of Science degree and registration in non-thesis M.S. or D.Eng. program.* Offered yearly, all quarters

4.834 Research Techniques II (4 q.h. credits)
Continuation of 4.833. *Prep. 4.833.* Offered yearly, all quarters

4.835 Analytical and Numerical Techniques (4 q.h. credits)
For students interested in solving comprehensive problems using computer methods. Problems solved in the course will be based on the interest of the students and staff and will be individual. *Prep. Bachelor of Science degree and knowledge of digital computer programming.*

4.838 Modeling and Simulation of Chemical Processes
Consideration of current approaches to steady and unsteady state process simulation. Structure of simulators. Computational efficiency. Convergence acceleration. Articles from the Chemical Engineering literature. *Prep. Undergraduate plant Design.*

4.840 Advanced Management Techniques in the Chemical Industry (4 q.h. credits)
Management techniques applied to the chemical industry. Special attention to management of research organizations and to management of engineering services, such as design, computer, and related activities. *Prep. Graduate standing.*
Offered yearly, winter quarter

4.845 Advanced Plant Design Concepts (4 q.h. credits)
Modern approaches to plant design; computer-oriented design, analysis and simulation of chemical processes, use of strategy decision making in design, advanced scheduling and planning techniques. *Prep. Undergraduate plant design course, knowledge of digital computer programming.* Offered yearly, spring quarter

4.850 Chemical Process Pollution Control (Water) (4 q.h. credits)
Provides chemical engineering students with basic fundamentals for handling environmental problems in the chemical process industries. Water quality requirements and industrial waste characteristics; wastewater treatment processes applicable to environmental engineering; biological treatment processes and equipment; comprehensive design problems involving biological and tertiary treatment; the economics of water treatment and reuse. *Prep. Graduate standing in Chemical Engineering. Open to selected ChE seniors.*

4.855 Wastewater Treatment Technology
Industrial waste treatment technology for various specific contaminants found in industrial wastes with emphasis on the chemical process industries. Information on sources and levels of contaminants, existing methods of treatment, levels of treatment attainable, and associated costs. *Prep. Graduate standing in Chemical Engineering.*

4.860 The Energy Crisis: A Survey
The energy resources of the United States in comparison to the projected demands upon them over the next two decades. Energy sources alternative to fossil fuels such as: nuclear power, hydropower, geothermal and solar power are discussed with regard to the feasibility of their extensive application by the year 2000. Focus upon technical requirements, and economic and environmental impact. *Prep. Bachelor of Science degree.*

4.861 The Energy Crisis: Fuel to Fuel Conversion
Energy problems associated with the oil, gas, and coal industries. The relative merits of various processes for converting one fuel to another, including the gasification of coal to produce either a low-BTU gas or pipeline quality gas. Production of oil from oil shale, coal, and tar sands. *Prep. Bachelor of Science degree.*

4.862 The Energy Crisis: Solar Energy
The role of solar energy as a future energy resource in relation to its present state of development. The characteristics of solar radiation and methods of collecting, storing and converting the energy. Emphasis on documented technical and economic experience with solar energy reported in the literature. Current research proposals aimed at harnessing the sun's energy. *Prep. Bachelor of Science degree.*

4.890 Seminar in Chemical Reactor Analysis (4 q.h. credits)
Effects of fluid mixing, temperature and reaction rate model on the performance of chemical reactors. Specific topics covered are macro- and micromixing in homogeneous media, boundary conditions for tubular flow reactors, stability of non-isothermal reactors, optimal reactor performance and radical polymerization. *Prep. Thermodynamics, undergraduate Chemical Engineering Kinetics or equivalent.*
Offered yearly, winter quarter

4.891 Selected Topics in Kinetics of Chemical Processes (4 q.h. credits)
Theoretical foundations are developed for the investigation and rationalization of chemical reaction rates. Rate theories regarding elementary steps; sequential reactions using the steady-state approximation; correlations of homogeneous and heterogeneous catalysis; matrix methods applied to the analysis of reaction networks. *Prep. Undergraduate Thermodynamics.* Offered yearly, fall quarter

4.899 Special Topics in Chemical Engineering (4 q.h. credits)
Topics of interest to the staff member conducting this class are presented for advanced study. A student may not take more than one Special Topics course with any one instructor. *Prep. Permission of department staff.* Offered yearly, all quarters

4.973 Special Topics in Chemical Process Heat Transfer (4 q.h. credits)
Empirical methods and calculations used to design heat transfer equipment for the chemical process industries. Review of basic heat transfer principles. Shell-and-tube calculations for liquid and/or vapor phase heat transfer. Direct contact and other special heat exchanger applications. *Prep. Undergraduate Heat Transfer.*

4.974 Selected Topics in Fluid Mechanics (4 q.h. credits)
Discussion of statics, kinematics, and stress concepts associated with fluids. Formulation of the general equations of motion with application to laminar and turbulent flow. Topics on boundary layer theory and compressible flow are included. *Prep. Undergraduate Fluid Mechanics.* Offered yearly, winter quarter

4.978 Separation Processes (4 q.h. credits)
Calculation and design methods used in processes involving mass transfer. Topics covered include vapor liquid equilibria for binary and multicomponent systems, multicomponent distillation, absorption and extraction. Emphasis is placed on methods and techniques which are common to many separation processes. *Prep. B.S. degree in Chemical Engineering.*

4.990 Seminar
Topics of an advanced nature are presented by staff, outside speakers, and students in the graduate program. This course must be attended by all master's degree candidates. *Prep. Admission to graduate program in Chemical Engineering.*
Offered yearly, all quarters

4.991 Thesis (Master's Degree)
Analytical and/or experimental work conducted under the supervision of the department. For master's degree requirement. *Prep. Admission to Master of Science program in Chemical Engineering.* Offered yearly, all quarters

4.995 Thesis (Ph.D. Degree)
Theoretical and experimental work conducted under the supervision of the department. *Prep. Admission to doctoral program in Chemical Engineering.*
Offered yearly, all quarters

4.996 Thesis (D. Eng. Degree)
Theoretical and experimental work conducted under the supervision of the department. *Prep. Admission to doctoral program in Chemical Engineering.*
Offered yearly, all quarters

INDUSTRIAL ENGINEERING AND ENGINEERING MANAGEMENT

5.801 Analysis of the Industrial Enterprise I
A background for the practicing engineer, covering the various phases of operation within the industrial enterprise; history and growth; management selection and development; labor-management relations; product development and marketing; public relations and the corporate image. *Prep. Bachelor of Science degree in Engineering or Science.* Offered yearly, all quarters

5.802 Analysis of the Industrial Enterprise II
The environment in which the industrial enterprise operates; modern planning and forecasting; meeting the technological advance; financial aspects within and without the company; the effect of the economic climate; community and government influences. *Prep. 5.801, Analysis of the Industrial Enterprise I.*
Offered yearly, all quarters

5.803 Industrial Organizations
An analysis of the purpose and functioning of organizations as the basic networks for goal satisfaction through coordination of effort, communication, and responsibility. The approach will be based on modern behavioral science concepts. *Prep. Admission to Program.* Offered yearly, days only, fall quarter

5.805 Industrial Budgeting for Engineers
Budgeting plans, programs, and reports for industry today; an introduction to the essentials of fixed and variable budgeting for production, inventory, sales, cash, capital, and cost-volume-profit analysis. *Prep. 5.810, Industrial Accounting or equivalent.*
Offered yearly, fall quarter

5.806 Production Forecasting
Econometric methods of forecasting the demand for industrial products; emphasis on techniques applicable to individual companies and the total demand. The principal tool used is the mathematical model of the causal factors with special attention to determining the reliability of the model. *Prep. 5.963, Engineering Statistics II or equivalent.* Offered yearly, fall quarter

5.808 Basic Engineering Economy
Economic analysis in formulating business policies and selecting alternatives from possible engineering solutions to industrial problems, present worth, annual cost, and rate of return techniques with continuous and discrete interest calculations. *Prep. Bachelor of Science degree in Engineering or Science.*
Offered yearly, all quarters

5.809 Advanced Engineering Economy
Principal emphasis on the practical application of the techniques studied in basic engineering economy; problems of implementation through class discussion of cases and a major term project; recent advances in the techniques of engineering economy, especially those relating to the consideration of uncertainties. *Prep. 5.808, Basic Engineering Economy or equivalent.*
Offered yearly, fall and winter quarters

5.810 Industrial Accounting for Engineers
Introduction of basic accounting principles and procedures; use of accounting data as a management tool; a practical coverage of basic cost procedures related to materials, labor, and manufacturing expense cost control; job order, process, and standard cost systems. *Prep. Bachelor of Science degree in Engineering or Science.* Offered yearly, all quarters

5.811 Cost Accounting for Engineers
Cost accounting procedures as established by accountants are studied and evaluated in terms of being considered by the engineer for cost determination of alternative engineering proposals. *Prep. 5.810, Industrial Accounting or equivalent.*
Offered yearly, winter quarter

5.812 Managing Professional Personnel
Analysis of the particular problems of managing creative people in research, development and engineering based on current developments in general management theory and the behavioral sciences; technical innovation as part of the overall organization; class discussion of cases and student term papers. *Prep. Bachelor of Science degree in Engineering or Science.*
Offered yearly, fall, winter and spring quarters

5.813 Engineering Communication
Exploration of practice in the effective preparation and presentation both written and oral, of the results of engineering projects and programs as a basis for business decisions: including formal reports, progress summaries, memoranda, and technical papers. The effective use of various media and audio visual aids based on both audience and material. Consideration of the types of audiences frequently encountered and their needs and reactions as factors in selecting approach. *Prep. Bachelor of Science degree in Engineering or Science.* Offered yearly, all quarters

5.814 Development of Engineering Managers
Analysis of the problems faced by the engineer in the transition from individual contributor to engineering manager; the challenge of engineering management; integrating profession and management objectives; developing guides for engineering managers, to examine their own work and performance, and to improve their effectiveness as well as develop managerial skills in their subordinates. *Prep. 5.801, Analysis of the Industrial Enterprise I.* Offered yearly, all quarters

5.816 Industrial Psychology for Engineers
A general coverage of the application of psychology to industry with emphasis on industrial environments and organization, human relations, group dynamics, tests and measurements, personnel practices, training, and motivation. *Prep. Bachelor of Science degree in Engineering or Science.* Offered yearly, all quarters

5.817 Advanced Work Design
Basic philosophies of work design; implementation of work design concepts with case studies; study and analysis of models such as work sampling, sequence or flow of work models; repetitive and nonrepetitive work models, and work measurement models such as standard data; human factors in measuring operator performance; regression analysis approaches; emphasis on development of professional, analytical, and managerial skills and abilities at a systems level. *Prep. Bachelor of Science degree in Engineering or Science.* Offered yearly, spring quarter

5.819 Human Factors in Man-Machine Systems
Design of equipment and systems for human use; emphasis on the application of engineering psychology; visual and auditory presentation of information — speech communications, man-machine dynamics, design of controls, layout of work places, and environmental effects on human performance. *Prep. Bachelor of Science degree in Engineering or Science.* Offered yearly, all quarters

5.820 Personnel Administration for Engineers
Personnel programs for attracting and retaining technical talent; evaluating effectiveness of major personnel policies; modern methods of salary and wage administration; planning profitable relationships among company, supervisors, and employees. *Prep. Bachelor of Science degree in Engineering or Science.*
Offered yearly, winter and spring quarters

5.822 Product Design and Value Analysis
Study of design parameters and their effect on development, manufacturing and procurement; functional analysis of components and systems; complete projects and case studies are integrated in the course. *Prep. Bachelor of Science degree in Engineering or Science.* Offered yearly, winter and spring quarters

5.823 Advanced Production Analysis (4 q.h. credits)
Study of advanced problem-solving techniques in the areas of method and measurement, layout and facilities planning, material handling and manufacturing process. Case studies and a course project in a local concern illustrate the concepts presented. *Prep. Bachelor of Science degree in Engineering or Science.*
Offered yearly, days only, fall quarter

5.824 Case Studies in Industrial Engineering
Formulation of problems and analysis of situations on topics such as: work measurement, line balancing, plant layout, regression analysis, wage and salary administration, management information systems and network analysis. Class discussion and written analysis of a variety of cases is included. *Prep. 5.823, Advanced Production Analysis.* Offered yearly, days only, spring quarter

5.825 Topics in Production Engineering
Production problems to include: line balancing, plant location, plant layout and material handling, design of manufacturing systems, job sequencing. Course utilizes

readings, projects and case studies. (Not open to those who have taken 5.823, Advanced Production Analysis.) *Prep. Bachelor of Science degree in Engineering or Science.* Offered yearly, winter quarter

5.830 Financial Management I
Study of the issues and processes of short-term financing of industrial firms; financial analysis of cases, supplemented by readings to develop familiarity with sources and uses of working capital as well as the goals and problems involved in its management. (Open to Engineering Management majors only.) *Prep. 5.801, Analysis of the Industrial Enterprise I, and 5.810, Industrial Accounting for Engineers, and 5.808, Basic Engineering Economy or equivalent.* Offered yearly, all quarters

5.831 Financial Management II
Extension of Financial Management I with emphasis on analysis necessary to such long-term financial decisions as issuance of stock or bonds; contracting of leases or loans, and financing of a new enterprise; mergers, capital budgeting, the cost of capital, and the valuation of a business. *Prep. 5.830, Financial Management I.* Offered yearly, all quarters

5.841 Engineering Project Management
The management of projects in technically based organizations. Applies a systems approach and provides an understanding of project management practices and techniques for the planning and control of tasks in a performing organization. Using a project life-cycle frame-work, coverage includes the principles and methodology of work definition, planning and scheduling resources, estimation and budgeting, technical performance — schedules and cost control systems. *Prep. 5.812 or 5.814, or Department permission.* Offered yearly, fall and spring quarters

5.853 Man-Computer Interaction
Design and evaluation of the Man-Computer Interface in on-line information systems: formatting of visual displays and auditory outputs, techniques to facilitate operator inputs, pacing and control of the interactive sequence, operator training, task analysis and performance testing. Student projects in areas of novel application. *Prep. 5.819, Human Factors in Man-Machine Systems.*

5.860 Health Care Organization and Management
History of the development and the delivery of health services; health organization functions and inter-relationships of health-oriented organizations; study of certain legal principles and rulings of importance to medical personnel; introduction to interpersonal ethics of patient care. *Prep. Admission to the Graduate School of Engineering.* Offered yearly, fall quarter

5.862 Introduction to Occupational Health and Safety
Accident prevention, accident cost analysis, Federal and local legislation, record keeping requirements under OSHA Act of 1970; occupational safety and health standards, safety programs and inspections, fire prevention and control methods; human behavior and industrial safety, occupational diseases and personnel protective equipment. *Prep. Bachelor of Science degree in Engineering or Science.* Offered yearly, fall quarter

5.863 Technical Aspects of Health and Safety
Safety responsibilities of management and employees; methods of hazard control; accident investigation; recognition of chemical, electrical and mechanical hazards; principles of machine guarding; occupational safety and health standards, safety training; toxology and first aid and medical services. *Prep. 5.862, Introduction to Occupational Health and Safety or permission of the instructor.*
Offered yearly, winter quarter

5.864 Topics in Physiology and Biomedical Engineering
Introduction to specific areas relating to human structure and function, and to the use of engineering techniques for medical diagnosis and therapy. Areas considered include blood and blood components, the cardiovascular system, the kidney and urinary systems and respiratory systems. The course will be taught on a seminar basis. Students will be required to do literature research under the guidance of the instructor. *Prep. Permission of instructor.* Offered yearly, spring quarter

5.865 Case Studies in Health Systems
Readings and discussion of case histories of application of systems analysis to field of health. Outstanding administrators and systems analysts from various health organizations will be invited to speak to class. *Prep. Admission to the Graduate School of Engineering.* Offered yearly, spring quarter

5.900 Basic Operations Research (4 q.h. credits)
An introduction to the theory and use of deterministic and stochastic models to represent industrial operations. Models included are those of linear programming, dynamic programming, inventory control, waiting lines, and Monte Carlo simulation. Embodies the material in 5.901 and 5.902, Basic Operations Research I and II. Open to both day and evening students. *Prep. 5.962, Engineering Statistics II or 10.8G1, Probability.* Offered yearly, fall quarter

5.901 Basic Operations Research I
Introduction to the theory and use of deterministic models to represent industrial operations; includes linear programming, dynamic programming, networks, and game theory. *Prep. Bachelor of Science degree in Engineering or Science.*
Offered yearly, all quarters

5.902 Basic Operations Research II
Introduction to the theory and use of stochastic models to represent industrial operations; includes queuing, inventory, and Markovian models. *Prep. 5.901, Basic Operations Research I and 5.962, Engineering Statistics III or equivalent.*
Offered yearly, all quarters

5.903 Inventory Control and Production Planning
The design and operation of inventory systems from a scientific management point of view, including both required theory and practical aspects. Subjects include inventory control models, statistical forecasting, production scheduling techniques, distribution systems, management control and reports, discussion of actual systems, and a case study. *Prep. 5.963, Engineering Statistics or equivalent.*
Offered yearly, spring quarter

5.904 Queuing Theory and Its Applications
A development of the theory of queues with emphasis on practical applications, using the latest techniques of Markovian state-transition diagrams to simplify the mathematic model; study of models based on random arrivals and departures including exponential and Erlang service distributions, single and multiple services, series and parallel systems, finite and infinite queues; applications to staffing, inventory control, reliability, maintenance and scheduling. *Prep. 5.900 or 5.902, Basic Operations Research* Offered yearly, winter quarter

5.905 Analysis with Simulation
Model building for digital simulation, testing and validation of models, simulation compiler languages, logic flow charting, applications drawn from economics, scheduling, inventory problems, marketing, and others; programming and running of several models. *Prep. 5.913, Data Processing for Engineers and 5.963, Statistics or equivalent.* Offered yearly, winter quarter

5.906 Principles of Dynamic Systems I
Introduction to modeling of social systems, emphasizing the study of feedback structures and their behavior; development of concepts that allow one to understand the mechanisms underlying growth, stagnation and cyclical fluctuation; examples and practice at formulating models of industrial, economic, social, and ecological systems; study of some of the effects of delays, multiple feedback loops, and nonlinearities; aim to building an intuitive foundation for simulation studies of complex systems. *Prep. Bachelor of Science degree in Engineering or Science.*
Offered yearly, fall quarter

5.907 Principles of Dynamic Systems II
Continuation of topics from 5.906 with increased experience in the construction and analysis of generic feedback structures; examination of current and previous System Dynamics applications including Urban Dynamics and World Dynamics; exercises in model conceptualization. *Prep. 5.906, Principles of Dynamic Systems I.*
Offered yearly, winter quarter

5.909 Systems Engineering and Analysis
Methods of describing, analyzing, and manipulating complex systems both open and closed loop; meaning of system optimization; classical optimization techniques; emphasis on the description and design of a system rather than system manipulation and on "complete" system rather than submanipulation; examples drawn from transportation, information, manufacturing, etc. *Prep. Admission to the Program.*
Offered yearly, days only, winter quarter

5.910 Analytical Techniques for Engineers
Linear algebra, transform techniques including Laplace transforms and z transform; systems of linear differential equations. *Prep. Bachelor of Science degree in Engineering or Science.* Offered yearly, fall quarter

5.911 Linear Programming
An in-depth development of the theory in formulating the linear programming model for solving the problems of resources allocation, blending of ingredients, cutting stock, and flow-network commonly found in industry; sensitivity analysis, duality

theorem, fundamentals of integer programming. *Prep. 5.900 or 5.902, Basic Operations Research or equivalent and a course in linear algebra.*
Offered yearly, winter and spring quarters

5.912 Network Planning and Control
Applications of stochastic networks to project management, scheduling, inventory, reliability, quality-control and other industrial applications; review of PERT and its inadequacies, to the development of stochastic flow-graphs and networks; solving for the mean task times and variances using moment-generating functions; setting up the model for computer simulation using GERT. *Prep. 5.962 Prob. of Statistics III*
Offered yearly fall and spring quarter

5.913 Data Processing for Engineers
Open only to students who have not had a basic course or extensive experience in a compiler language. A study of digital computers and computer programming techniques as applied to management problems. The course will cover the basic characteristics and operation of computing equipment and peripheral devices. The FORTRAN language is presented in depth and will be utilized by the student for programming and running several projects on a computer. Other compiler languages will be described and compared to FORTRAN. A systems approach to the design, development, and implementation of computer programs for solving management problems will be emphasized. Examples will be studied from several management areas. *Prep. Bachelor of Science degree in Engineering or Science.*
Offered yearly, all quarters

5.914 Advanced Operations Research (4 q.h. credits)
Further study of quantitative techniques available to assist management in scientific decision-making, including Markov processes, utility theory, Bayesian statistics, and forecasting; case studies of real industrial problems. *Prep. 5.900, Basic Operations Research.* Offered yearly, days only, spring quarter

5.916 Engineering Analysis Utilizing Data Processing
Engineering and quantitative management problems utilizing medium to large data processing systems; application areas include simulation and file management; the principles of modern operating systems are discussed in detail. *Prep. 5.913 or equiv.* Offered yearly, fall quarter

5.918 Advanced Operations Research I
Material covered in 5.918 and 5.919 identical to course 5.914. *Prep. 5.901 and 5.902.* Offered yearly, winter quarter

5.919 Advanced Operations Research II
Material covered in courses 5.918 and 5.919 identical to course 5.914. *Prep. 5.918.*
Offered yearly, spring quarter

5.930 Basic Computer Systems Technology
Introduction to computer systems and assembly language programming. Topics include: machine language, assemblers, and compilers. Input/output device control. List processing, searching, and sorting; file systems and storage management. Students are required to prepare and test several programs. The emphasis is on basic concepts necessary to understand and evaluate technological development. *Prep. 5.913.* Offered yearly, fall and winter quarters

5.931 Computer Systems
Introduction to hardwares and software packages, on-line real-time computer systems, and time-sharing and resource allocation. Telecommunications. Graphics terminals and data collection devices are also discussed. The course seeks to develop the student's understanding of computer technology so that he can successfully employ it in new and creative ways. *Prep. 5.930.*
Offered yearly, winter and spring quarters

5.932 Advanced Computer Systems
Topics in the forefront of the computer software field. Discussion of the design choices in Advanced Computer Systems raises the major design and operating issues concerning digital computers. *Prep. 5.931.*

5.940 Basic Information System Technology
Introduction to the concepts which support the field of information systems. Introduction to hardware and software systems and structuring problems in computer terms. Both lectures and cases are used to illustrate basic issues which include hardware components and their relative speeds, methods for balancing systems components, models of machines and concepts underlying application programs, translators, utilities, and operation systems. Data structures and data management are treated from the viewpoint of optimizing systems design for large scale data bases. *Prep. Bachelor of Science degree in Engineering or Science and 5.913.*
Offered yearly, fall and winter

5.941 Management Information Systems
The development of a framework which emphasizes support to management decision making. Theoretical and pragmatic considerations are used as a base from which a final framework is developed. This framework is applied to the design, installation, and evaluation of traditional management information systems (formerly 5.818). *Prep. Bachelor of Science degree for Engineering or Science.*
Offered yearly, all quarters

5.942 Information Systems Design
Designed to provide greater depth and some practical exposure to the issues and concepts raised in Management Information Systems. Topics will include design models for modular systems with emphasis on on-line, real-time systems and project planning and control. Offered yearly, spring quarters

5.943 Management Decision Systems Seminar
Seminar course exploring the design issues involved in building management decision systems. Includes methods of making explicit the manager's decision processes, as well as the design process for building effective man/machine systems. *Prep. 5.940, 5.941, 5.942.*

5.953 Statistical Decision Theory
Use of Bayesian statistical inference to arrive at decisions when stochastic variables are interacting; relationship to game theory; decision making over time in a sequence; important expected values and distributions; relationship of Bayesian decision theory to classical statistical inference. *Prep. 5.962, Engineering Statistics III or 10.8G1, Probability or equivalent.* Offered yearly, fall quarter

5.954 Advanced Quality Control
Mathematical methods of quality control; development of the process control charts for sampling by variables and by attributes; development of acceptance test procedures; development of life-testing plans; cost aspects of quality-control decisions. *Prep. 5.962, Prob. & Statistics III* Offered yearly, fall quarter

5.955 Mathematical Theory of Reliability
An introduction to the mathematical theory of reliability and maintainability applied to electrical and mechanical equipments, reliability allocations; failure and repair predictions at the component and system levels; stress-derating techniques; physics of sudden and wear-out failures; reliability/maintainability life-cycle costing plans; design reviews and managerial controls. *Prep. 5.962, Prob. & Statistics III*
Offered yearly, fall quarter

5.956 Reliability and Maintainability Assessment
The mathematical development of life-test plans for quality-control and reliability; failure-terminated, time-terminated and sequential test plans for reliability demonstrations; maintenance task-times plans for maintain-ability demonstration; economic aspects of each plan; managerial decisions. *Prep. 5.962, Prob. of Statistics III* Offered yearly, winter quarter

5.957 Reliability Analysis of Complex Systems
A Markovian-chain state-transition diagram approach to reliability modeling of non-maintained and maintained systems which permits analytic steady-state and dynamic solutions of both the stationary and non-stationary models; setting up the matrix-equations for solution by computer; controlling the numerical oscillations and accuracy of the results. *Prep. 5.955, Mathematical Theory of Reliability*
Offered yearly, summer quarter

5.960 Probability and Statistics I
Fundamental concepts of probability. Events, event space, sample space, sampling. Axiomatic development events and the algebra of events. Counting, permutations, combinations. Discrete and continuous random variables. Density functions, mass functions, cumulative probability distributions. Expectation of functions of random variables. Conditional, marginal joint distributions. *Prep. B.S. in Eng. Not to be taken by students who have completed course 5.950.* Offered yearly, fall and winter

5.961 Probability and Statistics II
Continuation of 5.960. Common discrete and continuous random variables to include binomial, poisson, hypergiometric, normal, exponential, gamma, X^2, F, uniform and student's t. Mean, variance, MGF, characteristic function. Derived distributions, change of variable. *Prep. 5.960. Not to be taken by students who have completed course 5.951.* Offered yearly, winter and spring

5.962 Probability and Statistics III
Limit theorems to include central limit, Chebyshevs, law of large numbers, Point and interval estimators. Properties of estimators — bias, sufficiency, variance. Estimation by moments, max likelihood, Bayes. Hypothesis and hypothesis testing. One and two sided tests. Type I and Type II error. Power curve. *Prep. 5.961. Not to be taken by students who have completed course 5.951.* Offered yearly, fall and spring

5.963 Statistics
Review of Hypothesis testing. Tests on mean, variance, difference in means. Courelation, curve fitting, least squares. Multiple regression analysis. Basic concepts of analysis of variance. One and two way classification. *Prep. 5.962.*
Offered yearly, fall and winter

5.964 Design of Exp. I
An introduction to experimental design and analysis: modeling for fixed, random and mixed factor designs such as: single factor, randomized blocks, Latin square and factorial experiments, analysis of variance and covariance, orthogonal contrasts. *Prep. 5.951. Not to be taken by students who have completed course 5.952.*
Offered yearly fail and winter

5.965 Design of Exp. II
Further design considerations in experimental design and analysis such as: nesting, split-plot, factorial confounding, fractional factorial, response surfaces. Computer applications to design analysis. *Prep. 5.952. Not to be taken by students who have completed course 5.958.* Offered yearly, spring

5.966 Probability and Statistics (4 q.h. credits)
Same material as 5.960 and 5.961 but offered as a 4 q.h. course
Offered yearly, fall quarter

5.991 Thesis (Master's Degree) (6 q.h. credits)
Analytical and/or experimental work conducted under the auspices of the department. *Prep. Consent of adviser.* Offered yearly, all quarters

5.992 Seminar in Industrial Engineering
Discussion and presentations of thesis related topics by students, presentations and discussions by faculty and eminent people in the field on timely industrial engineering topics. Field trips and visitations included where appropriate.
Offered yearly, days only, fall quarter

5.993 Special Problems in Industrial Engineering
Individual work under faculty supervision. *Prep. Consent of adviser.*
Offered yearly, all quarters

mathematics and physics

For mathematics and physics courses consult the bulletin of the Graduate School of Arts and Sciences.

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NORTHEASTERN UNIVERSITY

Graduate School of Engineering, Boston, Massachusetts 02115

ENG

APPLICATION FOR ADMISSION

This application should be completed and returned to the Graduate School of Engineering. The $15.00 application fee, which is not refundable, should accompany the application. Your check should be made payable to Northeastern University.

Date _____

Social Security Number _____

☐ Mr.
Name ☐ Mrs. _____
☐ Miss
Last First Middle

Present Address _____
Number and Street Telephone

_____
City State Zip Code

Permanent Address _____
(If different) Number and Street Telephone

_____
City State Zip Code

Graduate Department: ☐ Civil ☐ Chemical
☐ Mechanical ☐ Industrial
☐ Electrical ☐ Engineering Mgt.
☐ Transportation

Area of Concentration (Major): _____
(refer to catalog)

Program		Degree		Entering Quarter	
Full - Time		M. S.	☐	Fall	☐
Co - operative Plan	☐	Ph. D.	☐	Winter	☐
Continuous Full - Time	☐	D. Eng.	☐	Spring	☐
Part - Time	☐	Engineer Degree	☐	Summer	☐
		Special (non-degree)	☐		

Do you wish to transfer graduate credit from another institution? NO_____ YES_____ _____
INSTITUTION

Date of Birth: _____ Place of Birth _____

Military Status: _____ Marital Status: _____ No. Dependents _____

Citizenship: _____ if not U.S., type of visa: _____

List in chronological order **ALL** colleges and universities attended, including professional schools.

Name and Location	Month and Year of Attendance	Major	Degree received or expected and date
	from to		
	from to		
	from to		
	from to		

Academic Honors: _____

Activities: _____

List other activities since high school include military service but omit summer and part-time work not relevant to professional goal. Indicate present employer, if now employed.

Name of Employer	Location	Inclusive Dates	Kind of Work

Give the names and addresses of two people who are acquainted with your scholarship, training, and character.

Name	Address	Position

I hereby certify that the information given by me on this application is complete and accurate.

Applicant's signature _____ Date _____

The student must request that **official transcripts of all college and university work** previously taken be sent directly by the registrar of each institution attended. Students who have attended institutions outside of the United States should provide comparable certified documents. Such transcripts, records, and any required **standardized test scores** should be sent to the same address as given on the top of page one of this application. **This application cannot be considered until all these documents have been received.**

DO NOT WRITE BELOW THIS LINE

FULL-TIME STUDENTS

Application Received _____

Approval _____ _____
Admissions Committee Date

_____ _____
Co-operative Education Department if necessary Date

Classification:

Teaching Assistant _____

Tuition Assistant _____

Research Fellow _____

Co-op Student _____

Other _____

PART-TIME STUDENTS

Application Completed _____

Transcript received _____ Requested _____

Department _____ Major _____

Regular _____ Provisional _____

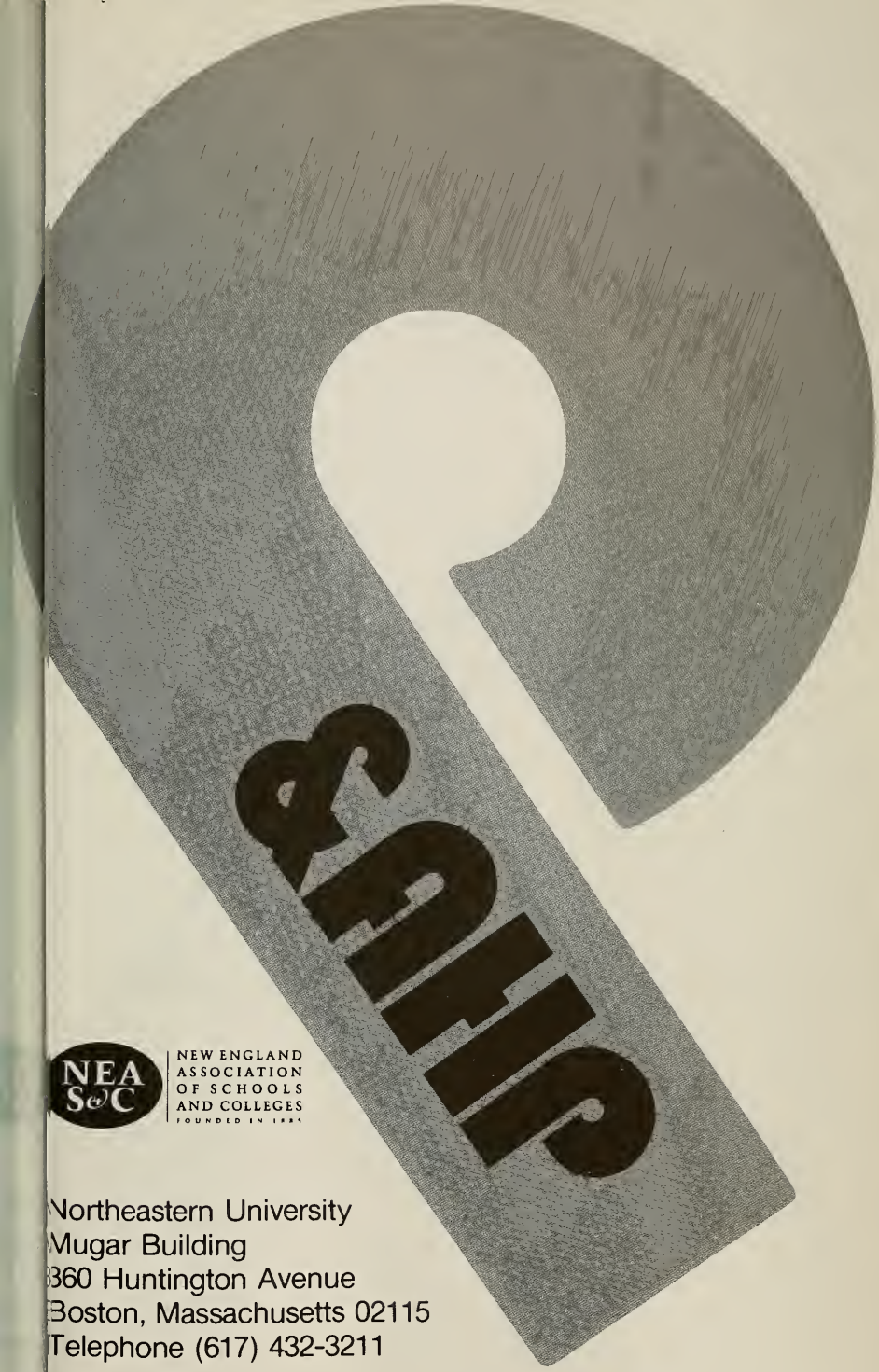
Special _____ Conditional _____

Specified _____ Unspecified _____

Special Requirements:

Signed _____

uate school of pharmacy and allied health professions



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graduate school of pharmacy and allied health professions
northeastern university 1976-1978

NORTHEASTERN

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Academic and Service Buildings	Map Code	Bldg. Code
African-American Institute	I3	AF
Barletta Natatorium	G6	BN
Botolph Building	G10	BT
Cabot Physical Education Center	G6	CB
Cahners Hall	C6	CA
Churchill Hall	H6	CH
Cooperative Education Building	F4	ST
Cushing Hall	B6	CU
Dana Research Center	I5	DA
Dockser Hall	G5	DK
Dodge Library	G9	DG
Ell Student Center (Auditorium section)	G8	EL
Ell Student Center (Student Lounge section)	H8	EC
Forsyth Building	H6	FR
Forsyth Building Annex	H5	FA
Greenleaf Building	G4	GR
Hayden Hall	G7	HA
Hurtig Hall	H11	HT
Kerr Hall (Faculty Center)	B6	KH
Knowles Center (Gryzmish Hall section)	F5	KG
Knowles Center (Volpe Hall section)	F5	KV
11 Leon Street	J3	UO
15 Leon Street	J3	UN
Mugar Life Sciences Building	G9	MU
Parker Building	G3	PA
Richards Hall	F7	RI
Robinson Hall	H10	RB
United Realty Building	H5	UR
Dormitories		
115 Hemenway Street	A8	15
119 Hemenway Street	A8	19
153 Hemenway Street	B7	53
157 Hemenway Street	B6	57
163 Hemenway Street	C6	63
Kerr Hall	B6	KH
Light Hall	D10	LH
Melvin Hall	B7	MH
106-122 St. Stephen Street	E8	SS
Smith Hall	B8	SH
Speare Hall	E7	SP
Stetson Hall East	C7	SE
Stetson Hall West	D7	SW
White Hall	E5	WH

ACADEMIC CALENDAR 1976—1977

Fall Quarter 1976

Registration period		
Burlington	Tuesday—Wednesday	Sept. 14—15
Boston	Monday—Thursday	Sept. 20—23
Classes begin	Monday	Sept. 27
Examination period	Monday—Saturday	Dec. 13—18

Winter Quarter 1976—1977

Registration period		
Burlington	Tuesday	Nov. 30
Boston	Monday—Thursday	Dec. 6—9
Classes begin	Monday	Jan. 3
Examination period	Monday—Saturday	Mar. 21—26

Spring Quarter 1977

Registration period		
Burlington	Tuesday	Mar. 8
Boston	Monday—Thursday	Mar. 14—17
Classes begin	Monday	Apr. 4
Last day to file card for		
Spring Commencement	Friday	Apr. 1
Last day to pay fee for		
Spring Commencement	Friday	Apr. 29
Final grades due in Registrar's		
Office for June graduates	Friday	June 3
Examination period	Monday—Saturday	June 13—18
Spring Commencement	Sunday	June 19

Summer Quarter 1977

Registration period		
Burlington	Monday—Tuesday	June 13—14
Boston	Wednesday—Thursday	June 15—16
Classes begin	Monday	June 27
Last day to file card for		
Fall Commencement	Friday	July 1
Last day to pay fee for		
Fall Commencement	Monday	Aug. 1
Examination period	Wednesday—Thursday	Aug. 3—4

UNIVERSITY HOLIDAYS 1976—1977

Columbus Day	Monday	October 11
Veterans' Day	Thursday	November 11
Thanksgiving Recess	Thursday—Saturday	November 25—27
Christmas Vacation	Monday—Saturday	Dec. 20—Jan. 1
Martin Luther King Day	Saturday	January 15
Washington's Birthday	Monday	February 21
Patriot's Day	Monday	April 18
Memorial Day	Monday	May 30
Independence Day	Monday	July 4
Labor Day	Monday	September 5

Equal Opportunity Policy

Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admissions, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or on the basis of being a handicapped but otherwise qualified individual. In addition, Northeastern takes affirmative action in the recruitment of students and employees.

the governing boards and officers of the university

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University Graduate Council
1976—1977

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the university

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which is composed of nearly 180 distinguished business and professional men and women.

From its beginning, Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964); Boston-Bouvé College (1964); the College of Criminal Justice (1967); and by Lincoln College's daytime Bachelor of Engineering Technology program (1971). This educational method enables students to gain valuable practical experience as an integral part of their college program and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, actuarial science, rehabilitation administration, professional accounting, business administration, and law.

In the field of adult education, programs of study have been developed to meet a variety of needs. University College offers evening courses — offered by the University since 1906 — and adult-day courses leading to the bachelor's degree. In addition to offering day undergraduate programs in Electrical Engineering Technology and Mechanical Engineering Technology, Lincoln College offers evening/part-time certificate, associate, and bachelor degree programs in technological areas. All formal courses of study leading to degrees through part-time programs are approved by the Basic College faculties concerned.

GRADUATE AND PROFESSIONAL SCHOOLS

The 10 graduate and professional schools of the University offer day and evening programs leading to the degrees listed.

The Graduate School of Actuarial Science offers the degree of Master of Science in Actuarial Science.

The Graduate School of Arts and Sciences offers the degrees of Master of Arts, Master of Science, Master of Science in Health Science, Master of Public Administration, and Doctor of Philosophy.

The Graduate School of Boston-Bouvé College offers the degree of Master of Science, with specialization in Physical Education and Recreation Education.

The Graduate School of Business Administration offers the degree of Master of Business Administration.

The Graduate Program in Criminal Justice offers the degree of Master of Science.

The Graduate School of Education offers the degree of Master of Education, the Certificate of Advanced Graduate Study, and the Doctor of Education.

The Graduate School of Engineering offers the degrees of Master of Science, Engineer degree, Doctor of Engineering, and Doctor of Philosophy.

The School of Law offers the degree of Juris Doctor.

The Graduate School of Pharmacy and Allied Health Professions offers the degrees of Master of Science and Doctor of Philosophy.

The Graduate School of Professional Accounting offers the degree of Master of Science in Accounting.

CENTER FOR CONTINUING EDUCATION

The Center for Continuing Education was established in 1960 to relate the University to the needs of its community in a period of accelerated change. Adult education programs offered by the Center and University College have since been consolidated. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

RESEARCH ACTIVITIES

The facilities of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning take place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

buildings and facilities

MAIN CAMPUS

The main campus of Northeastern University is located at 360 Huntington Avenue in the Back Bay section of Boston. Many of the city's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, the Isabella Stewart Gardner Museum, the Harvard teaching hospitals, the Boston Public Library, and many schools and colleges. Most are within walking distance of Northeastern University.

Major transportation facilities serving the Boston area are Logan International Airport, two rail terminals, bus terminals serving inter- and intrastate lines, and MBTA subway-bus service within the metropolitan suburban area. There is a subway stop in front of the campus. For motorists, the best routes to the campus are the Massachusetts Turnpike (Exit 22) and Route 9, of which Huntington Avenue is the intown section.

The campus of 48 acres is divided by Huntington Avenue, with the main educational buildings on one side and dormitories on the other. The principal buildings, all of which have been constructed since 1938, are of glazed brick in contemporary classic style. Most are interconnected by underground passageways.

Ell Student Center

The Carl S. Ell Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of the Center. Also included are special drama facilities, a ballroom, main lounge, fine arts exhibition area, student offices, conference rooms, and a dining area seating more than 1,000.

Libraries

The University library system consists of the Dodge Library, which is the main library; the Suburban Campus Library at Burlington; the School of Law Library; and divisional libraries for Physics and Electrical Engineering, Chemistry and Biology, Mathematics and Psychology, and Health, Physical and Recreation Education, and Physical Therapy. There are additional subject collections for the Center for Management Development at Andover, Massachusetts, and the Marine Science Institute in Nahant.

The library collections number 400,000 volumes supplemented by some 333,000 titles in microprint, microfilm, and microfiche forms. The collection includes, in addition, some 3,700 periodical titles, 100,000 documents, and 4,600 sound recordings.

Cabot Physical Education Center

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. The large gymnasium contains four basketball courts. In addition, the Center consists of an athletic cage, a small gymnasium, and a rifle range, as well as administrative offices for the Department of Athletics and for the Physical Education Department of Boston-Bouvé College.

A recent addition to the Center, the Barletta Natatorium, houses a 105-foot swimming pool, a practice tank for the crew, handball courts, and shower and dressing facilities.

Dockser Hall

Charles and Estelle Dockser Hall, completed in 1968, houses a large gymnasium, dance studio, motor performance laboratory, college library, community recreation laboratory, folk arts center, dark and music rooms, recreation resources area, locker rooms, offices, classrooms, conference room and lounge, storage facilities, and a research laboratory.

Apartments for Graduate Students

The University maintains a 100-apartment housing unit which accommodates 279 people. Two-, three-, and four-party apartments are available which vary in size from two to four rooms plus bath. Apartments are furnished with beds, chairs, desks, stove, refrigerator, and kitchen table. The cost includes all utilities.

A $100 deposit is required when making application for the apartments. Applications are available in the Office of University Housing. Students are expected to make such arrangements on a term-to-term basis but may live in the apartments both while on cooperative work assignments and in school if they wish. All reservations are made on a first come, first served basis.

SUBURBAN FACILITIES

Suburban Campus

The Suburban Campus, located near the junction of Routes 128 and 3 in Burlington, Massachusetts, was established to meet the needs of individuals and of industry in the area.

In addition to graduate courses in engineering, business administration, science, education, and the arts, portions of undergraduate programs leading to the associate and bachelor degrees, special programs for adults, and noncredit state-of-the-art programs are offered.

Warren Center

The Warren Center is a practical laboratory for Boston-Bouvé College in outdoor education and conservation, in group practicum, and in camping

administration, programming, and counseling. At this Center in Ashland, completed in 1967, there are tennis courts, field hockey and lacrosse fields, waterfront for swimming and boating, overnight camp sites, fields and forests, heated cottages, the Hayden Lodge with a recreation hall, library, crafts shop, dining facilities, and conference accommodations.

Henderson House

The University's conference center, Henderson House, is located in Weston, Massachusetts. The Center for Continuing Education conducts short-term courses, seminars, and special institutes for business, professional, and research groups. Henderson House is 12 miles from the main campus.

Marine Science Institute

The Marine Science Institute at Nahant, Massachusetts, is a research and instructional facility primarily engaged in studies of marine biology and oceanography. The Institute is operated all year, and is about 20 miles northeast of Boston. Many of the courses at this Institute are applicable toward an advanced degree in biology or health science.

Government Center Campus

With the cooperation of the Federal Executive Board, the Graduate School of Liberal Arts' Department of Political Science offers an entire Master of Public Administration program at the John F. Kennedy Building in downtown Boston. This program is primarily for individuals employed in Federal, state, or local civil services.

Brockton, Nashua, and Framingham Campuses

For students residing in southeastern Massachusetts and northeastern Rhode Island, the Graduate School of Business Administration offers a significant portion of its M.B.A. Program at facilities in Brockton, Massachusetts. These facilities, made available by the Knapp Corporation, are located on West Chestnut Street in Brockton.

Students residing in the southern New Hampshire area may take a significant portion of the M.B.A. Program at facilities in Nashua, New Hampshire. These facilities are furnished by Sanders Associates, Inc. and are located in their headquarters on Route 3, just over the Massachusetts line.

For students in the Framingham-Worcester area, a significant portion of the M.B.A. Program may be taken at classroom facilities located in Framingham, Massachusetts.

the graduate school of pharmacy and allied health professions

The New England College of Pharmacy merged with Northeastern University in 1962 to become the College of Pharmacy of Northeastern University. The Graduate School of Pharmaceutical Sciences was established in 1964 and offered on a full-time basis Master of Science degree programs in Hospital Pharmacy, Industrial Pharmacy, Medicinal Chemistry, and Pharmacology. All of these programs involved one year of planned cooperative work experience. In 1970 a doctoral program leading to the Ph.D. in Medicinal Chemistry was instituted.

The necessity for making these Master of Science degree programs more relevant to the greater Boston community led to the establishment of part-time evening programs. In 1971 the Division of Allied Health Sciences joined with the College of Pharmacy to establish the new College of Pharmacy and Allied Health Professions. In 1972 two new part-time Master of Science degree programs were inaugurated, one in Medicinal Laboratory Science and the second in Clinical Chemistry, the latter being cosponsored by the Chemistry Department in the Graduate School of Arts and Sciences. In 1974 a Master of Science degree program in Radiopharmaceutical Science was established.

Currently the College offers the following graduate programs:

Master of Science
- Clinical Chemistry
- Hospital Pharmacy
- Medical Laboratory Science
- Medicinal Chemistry
- Pharmacology
- Radiopharmaceutical Science

Doctor of Philosophy
- Medicinal Chemistry

Interdisciplinary Doctor of Philosophy
- Clinical Chemistry
- Forensic Chemistry
- Pharmacology
- Radiopharmaceutical Science

GENERAL REGULATIONS

The general regulations that follow are minimal requirements shared by the several degree programs. The student is advised to consult the appropriate program for a statement of specific requirements.

Application

Applicants should address their inquiries to the Director of the Graduate School of Pharmacy and Allied Health Professions. Application forms and other pertinent information will then be mailed to them. Submission of the completed forms, together with all official transcripts and two letters of recommendation, is essential before potential students can be considered for admission to a specific degree program. Applicants whose native language is not English must take the Test of English as a Foreign Language and submit the results to the Director of the Graduate School of Pharmacy and Allied Health Professions. All necessary supporting documents must be on file at least four weeks before the date of registration for the quarter in which the student expects to begin his scholastic program. Consideration of applications received after this date may be delayed.

Applicants to the doctoral program who desire assistantships should apply no later than March 15. It may not be possible to give equal consideration to applications received after this date. Candidates for financial awards should so indicate in their letter of application. These awards are restricted to full-time doctoral students. Such applicants are strongly urged to take both the aptitude and advanced portions of the Graduate Record Examination.

Admission

To be enrolled for graduate work, an applicant must submit a complete official transcript indicating the award of a baccalaureate degree from a recognized institution. He must also provide evidence of his ability to pursue creditably a program of graduate study in his chosen field. His scholastic record must therefore show academic distinction, and his undergraduate program must show breadth as well as adequate preparation in his field of anticipated specialization. Acceptance to the school is granted upon recommendation of the Graduate Committee of Pharmacy and Allied Health Professions after a review of the completed application.

Foreign students who do not receive a graduate award or whose award is insufficient to cover all educational and living expenses must certify that they are able to meet all such expenses while at Northeastern. A visa may not be granted without such certification. Foreign students should note that many of the master's degree programs are part time and, therefore, students are not eligible for I-20 visas.

Student Classifications

Regular Students — Those students accepted to a specific degree program.

Special Students — Students who have been accepted in the graduate school, but who are not formally matriculated in a degree program. Students in this category who wish to be admitted to a degree program must petition the Graduate Committee requesting a change in status. This request is to be made after the completion of 12 quarter hours of graduate credit. No more than 16 quarter hours may be transferred from the Special Student category to a degree program. In those instances where additional courses have been taken, only the first 16 quarter hours of credit will be accepted. Special Students are expected to obtain a B average. All courses within this 16 quarter hour limitation will be transferred if the student is admitted to a degree program; included will be C, F, and I grades. It is the student's responsiblity to request a change of status in writing.

Doctoral Students — Students admitted to a doctoral program.

Doctoral Degree Candidates — Doctoral students who have completed 40 quarter hours of acceptable graduate work and who have passed the qualifying examination.

Registration

Students must register within the dates and times listed on the school calendar. The place of registration is announced prior to each period.

Residence

All course work for advanced degrees must be registered for and completed at Northeastern University unless the Graduate Committee has granted approval of work taken elsewhere.

Programs of Study

The study load for full-time students is 8 quarter hours of course work or a combination of fewer credits together with an independent research project. Students involved in such a project will work closely with their advisors to determine their individual course load assignments. Part-time students decide upon their course load after consulting with the director of their specific program. Courses in most fields are generally offered in the late afternoon and evening. Exceptions to this are posted with the quarterly list of course offerings.

Grading System

Performance of students in graduate courses is graded as follows:

A Excellent
This grade is given to those students whose performance in the course has been of very high graduate caliber.

B Satisfactory
This grade is given to those students whose performance in the course has been at a satisfactory level.
C Fair
This grade is given to those students whose performance in the course is not at the level expected in graduate work.
F Failure
This grade is given to those students whose performance in the course is unsatisfactory.

In addition, the following letter designations are used:
I Incomplete without quality designation.
This grade may be given to those students who fail to complete the work of the course.
L Audit without credit.
S Satisfactory without quality designation.
U Unsatisfactory without quality designation.
An S or U grade is used for the first quarter of a two-quarter sequence in which the grade for the second quarter applies to both the first- and second-quarter sequence.

The I grade will be changed to a letter grade when the deficiency which led to it is made up to the satisfaction of, and in the manner prescribed by, the course instructor, or, in his absence, by the chairman of the department issuing the grade. The period for clearing such a grade is restricted to one calendar year from the date of its first recording on the student's permanent record.

Students must indicate their preference for auditing a course at registration. No credit is given for the course; however, it will appear on the student's transcript. Registration changes from an audit to a graded status, or vice versa, must be made prior to the second week of classes. The tuition fee for an audit course is the same as that for a graded course.

Class Hours and Credits

All courses are entered as quarter-hour credits. A quarter hour of credit is equivalent to three fourths of a semester-hour credit.

Continuity of Program

Students are expected to maintain continuous progress toward a degree. Any student who does not attend Northeastern for a period of one year must apply for readmission.

Withdrawals

In order to withdraw from a course, a student must complete an official withdrawal form obtained at the Registrar's Office or at the Suburban Campus Office. Withdrawals may be made through the first six weeks of the course or upon the receipt of a mid-term examination, whichever is later.

Students are withdrawn on the date at which the official form is filed with the Registrar. Ceasing to attend class or notifying the instructor does not constitute official withdrawal.

Changes in Requirements

The continuing development of the Graduate School forces frequent revision of curricula. In every new bulletin some improvements are indicated. When no hardship is imposed on the student because of changes, and when the facilities of the school permit, the student is expected to meet the requirements of the current bulletin. Any deviation from this must be requested by petition to the Graduate Committee.

Application for the Diploma

A commencement card must be filed with the Registrar's Office on or before the applicable date listed in the calendar. For students failing to file, there is no assurance that the degree will be granted in that particular year, even though all other requirements have been fulfilled.

THE MASTER OF SCIENCE DEGREE

Admission

Specific requirements for each degree program are found in the appropriate paragraphs for each program, beginning on page 36.

Academic Requirements

A candidate for the master of science degree must complete a minimum of 40-43 quarter hours of correlated work of graduate caliber and such other study as may be required by the specific program.

During the first half of the total course work hours required for the degree, the candidate is expected to maintain a minimum quality-point average of 2.5. At completion of three fourths of the total course work hours required for the degree, the candidate is expected to have a quality-point average of 2.8. To qualify for the degree, he must obtain a final average of 3.0, equivalent to a grade of B. This average is calculated quarterly by the graduate school on the basis of A = 4, B = 3, C = 2, and F = 0, and excludes any transfer credits from outside the University.

Not more than four quarter hours (generally two courses) of repeated courses, additional courses, or permanent Is may be allowed in order to satisfy the degree requirements.

Within the above limitations, a required course for which a grade of F is received must be repeated with a grade of C or better, and may be repeated only once. If a grade of F is received in an elective course, that course may be repeated only once to obtain a grade of C or better, or another elective course may be substituted for it. If a grade of C is received in a required course, that course may be repeated once to obtain a grade of B or better.

Obtaining a Second Master's Degree

Students who have completed an M.S. degree in the Graduate School of Pharmacy and Allied Health Professions and wish to obtain a second master's degree, should petition to do so. Students will be required to complete all the requirements listed for the second program, taking a minimum of 16 additional quarter hours of graduate credit.

Transfer Credit

A maximum of 12 quarter hours of credit obtained at another institution may be accepted toward the master's degree, provided that the credits transferred consist of A or B grades in graduate-level courses, are in the candidate's field, have been earned at a recognized institution, and have not been applied toward any other degree. Students should petition the Graduate Committee in writing for all transfer credit. Transfer credit grades may not be used in order to obtain the academic average necessary for completion of degree requirements.

Students changing majors within the College or University will receive transfer credit on a graded basis for ALL required courses taken in the desired new major. In addition a maximum of 12 quarter hours of credit for courses in the elective categories completed with the grades of A or B may be transferred. Transfer credit for elective courses may not be used in order to obtain the academic average necessary for completion of degree requirements.

Time Limitation

Course credits earned in the program of graduate study, or accepted by transfer, are valid for a maximum of seven years unless an extension is granted by the Committee of the Graduate School of Pharmacy and Allied Health Professions.

THE DOCTOR OF PHILOSOPHY DEGREE

The doctor of philosophy degree is awarded to candidates who give evidence of high attainment and research ability in their major field. The degree requirements are administered by the Graduate Committee. It is the responsibility of the Director of the Doctoral Program to certify to the Graduate Committee the completion of all requirements for each candidate.

Admission

The degree program in the Department of Medicinal Chemistry and Pharmacology has an established admission procedure for students starting doctoral work at Northeastern University. The Ph.D. in Medicinal Chemistry provides specialization in the fields of Clinical Chemistry, Forensic Science, Pharmacology, Radiopharmaceutical Science, and Synthetic Medicinal Chemistry.

Residence Requirements

Candidates for the doctor of philosophy degree must spend the equivalent of at least one academic year in residence at the University as full-time graduate students. The Graduate Committee specifies the method of satisfying the residence requirement.

Doctoral Entrance Examination

Upon acceptance into the doctoral program, the student must take an entrance examination. The purpose of this examination is twofold: to test his undergraduate knowledge and skills considered essential to success in the field of specialization, and to aid both the student and a selected faculty adviser in course selection to overcome existing deficiencies in academic background. Within one year of admission to the doctoral program, the student is allowed two opportunities to pass the examination.

At its discretion, the Department of Medicinal Chemistry and Pharmacology may drop a student from the doctoral program if the results of the doctoral entrance examination reveal deficiencies too great to be removed within one year.

Qualifying Examination

A qualifying examination is prepared by members of the department and given twice each academic year. It is expected that a student will take this examination within two years from the date of the doctoral entrance examination. The purpose of the qualifying examination is to test the student's knowledge and skills in medicinal chemistry and especially his knowledge of recent developments in this field.

This examination is composed of two parts:

1. A written examination in areas of specialization in the department to be determined by the department.
2. An oral examination, given approximately two weeks after completion of part 1. The oral examination committee consists of the dissertation adviser (selection discussed below), two other members of the Department of Medicinal Chemistry and Pharmacology, and one member of the University from outside the Department selected by the Department Chairman. The student must pass the written portion before taking the oral examination at the scheduled time. Students failing the written part of the qualifying examination are given one opportunity to remove this failure by a make-up examination. Similarly, students have one additional opportunity to pass the oral examination. Students must make up any failure at the first opportunity. Those failing either portion of this examination twice are dropped from the program. A student who passes the qualifying examination and completes 40 quarter hours of graduate work with a 3.0 average is designated a Doctoral Degree Candidate.

Course Requirements

The minimum course requirement of 40 quarter hours of credit constitutes the work normally required for the master's degree. The course requirements beyond this total for the Ph.D. degree will depend upon the needs and interests of the individual.

Transfer Credit

If transfer credit for doctoral work is desired, approval of such credit must be given by the Director of the Ph.D. program. A maximum of 12 quarter hours of graduate credit obtained at a recognized institution are accepted, provided that the credits transferred are in the candidate's field, consist of work taken at a graduate level for graduate credit, and carry grades of A or B. Students should petition the Director of the Graduate School of Pharmacy and Allied Health Professions in writing for all transfer credit.

Dissertation

Each doctoral student must complete a dissertation which embodies the results of extended research and which makes an original contribution to the field. This work should give evidence of the candidate's ability to conduct independent investigation and to interpret the results of his research in an acceptable manner.

Selection of a thesis adviser must be made within four months of the student's completion of the entrance examinations. An adviser is selected by mutual consent of the student and a member of the faculty in the Department of Medicinal Chemistry and Pharmacology. It is expected that the student will begin his research and demonstrate satisfactory proficiency in the laboratory prior to the qualifying examination.

The thesis adviser serves as Chairman of the Thesis Committee, which consists of not less than three members. Individuals are chosen for expertise in the student's area of research. His research progress is evaluated by this Committee, meeting no less than twice a year. Low productivity or unsatisfactory work provides the basis for warning by this Committee. Two such warnings result in a student's dismissal from the program at any stage.

Foreign Language

A reading knowledge of one foreign language (French, German, or Russian) is required. The Thesis Committee prescribes the manner in which proficiency in the language is determined.

Research Proposal Defense

After completion of the qualifying examination, and prior to the final oral, the student, with the approval of the Thesis Committee, prepares a written

proposal in an area distinctly different from his thesis. He then defends it orally before this Committee.

Final Oral Examination

The final oral examination is taken after the completion of all other requirements for the degree. This examination must be held at least three weeks before the commencement at which the degree is to be awarded.

The Thesis Committee conducts the final oral examination. The Director of the Graduate School of Pharmacy and Allied Health Professions, together with the Department Chairman and the thesis adviser, appoint any additional members to this Committee which they consider necessary.

The final oral examination deals with the subject matter of the doctoral dissertation, significant developments in the field of the dissertation, and the student's background knowledge in his field of specialization.

Time Limitation

After the establishment of degree candidacy, a maximum of five years is allowed for completion of the degree requirements.

Registration

All students must register in the Registrar's Office for course work or dissertation as approved by the faculty adviser. Students must be registered for the dissertation during the quarter in which they take the final oral examination.

Curriculum Design

The graduate school recognizes the divergent backgrounds and goals for individuals who may be accepted into this program. Accordingly, the program is designed to offer flexibility in course selection so as to maximize its relevance to the student's career objective.

INTERDISCIPLINARY PROGRAMS

Some graduate students may wish to pursue doctoral programs which involve substantial work in two or more departments. To meet this need, an interdisciplinary program may be established which corresponds in scope and depth to doctoral standards, but which does not agree exactly with the individual departmental regulations. For such possibilities, the following option is available.

Admission

Application for admission to interdisciplinary doctoral study consists of the submission of a carefully thought-out, written proposal describing the areas of projected study and research. The proposal may be a part of the

initial application for admission to graduate study at Northeastern University, or it may be submitted by a student already enrolled. It may be directed to a doctoral degree-granting department or to the Director of the Graduate School, who will then forward it to the appropriate department. In either case, admission to interdisciplinary doctoral study requires favorable recommendation by the sponsoring doctoral degree-granting department and approval by the Graduate Committee of the Graduate School of Pharmacy and Allied Health Professions.

Formation of Interdisciplinary Committee

A student who has been accepted for interdisciplinary study must obtain the consent of an adviser who will direct his doctoral dissertation. This adviser, who may or may not be a member of the sponsoring department, serves as Chairman of the Interdisciplinary Committee for this student. A second member is appointed from the sponsoring department by its chairman. These two members obtain one or more additional members or request the Director of the Graduate School of Pharmacy and Allied Health Professions to do so. At least two departments must be represented on the committee, and a majority of the committee members must come from doctoral degree-granting departments. The chairman of the sponsoring department notifies the Director of the Graduate School of the committee membership as soon as possible.

Duties of Interdisciplinary Committee

A member of the Interdisciplinary Committee who is also a member of the sponsoring department serves as the registration officer to approve the student's course registration. A copy of the approved course registration must also be filed with the other committee members and with the Graduate Committee.

The Interdisciplinary Committee is responsible for the administration of the qualifying examination, language examination, approval of the dissertation, and comprehensive examination. This Committee must also certify to the sponsoring department the completion of the requirements for the doctoral degree.

The Interdisciplinary Committee must be assured that the student's program represents standards comparable to those of the sponsoring department and that the program is not so broad that it has inadequate depth in any area. The Director of the Graduate School may review the program at any time to determine whether its objectives are being met.

financial information

FINANCIAL OBLIGATIONS

Tuition

Tuition rates are subject to revision by the Board of Trustees and may change year by year. The current rate is stated in a covering letter for the specific year and program.

Doctoral candidates actively utilizing the resources of the University in their Ph.D. dissertation are charged an additional $600 per quarter. Those doctoral candidates registered for dissertation work performed off campus are charged $200 in addition to tuition charges each quarter, and those doctoral candidates who are no longer actively utilizing University resources are charged a continuation fee of $50 per quarter.

Tuition statements are mailed to students by the Bursar's Office and are payable by check to Northeastern University.

Fees

All students are charged an application fee of $15 when they apply for the first time to a graduate school at Northeastern University.

Other fees include a charge of $10 for late payment of tuition and a fee of $25 for all degree candidates, payable before commencement by the applicable date listed on the academic calendar.

For full-time students there is a charge of $12.50 per quarter for the services available in the Student Center. For teaching assistants and research fellows, the fee is $6.25 per quarter. All part-time students on the Huntington Avenue Campus are charged 75 cents per quarter.

All full-time students pay a nonrefundable University Health Services fee of $120 each year. This fee provides Blue Cross-Blue Shield coverage and entitles the student to the medical care furnished by the University Health Services. Tuition and fees are subject to change without notice.

All financial obligations to the University must be discharged prior to graduation.

Refunds

Tuition refunds are granted only on the basis of the date appearing on the student's official withdrawal form. Nonattendance does not constitute official withdrawal. Questions regarding refunds should be directed to the Bursar's Office.

Refunds are granted in accordance with the following schedule:

Official Withdrawal Filed Within:	Percentage of Tuition:
First week of quarter	100
Second week of quarter	75
Third week of quarter	50
Fourth week of quarter	25

FINANCIAL AID

Northeastern University offers fellowships and assistantships for full-time students who are working toward the doctor's degree. They may establish candidacy for these awards by completing the relevant section of the application for admission. Students already enrolled should consult their departmental adviser. There is no financial aid available for the Master of Science programs or for those students enrolled in the Special Student category. Those individuals auditing any course must remit full tuition.

The University does not award financial assistance in any form to students who are not citizens or permanent residents of the United States.

Tuition Assistantships

The College of Pharmacy and Allied Health Professions provides remission of tuition to full-time students assisting eight hours a week in departmental administrative work.

Teaching Assistantships

Teaching Assistantships allowing remission of tuition and a stipend are available to Ph.D. candidates in Medicinal Chemistry. Those holding such awards devote half time to academic assistance directly related to the teaching function and the balance to course work.

Research Fellowships

Research fellowships, including those supported by the National Institutes of Health, carry a stipend and remission of tuition. Certain of these grants require half-time work on research in the department, with the remaining time devoted to course work. Others provide for full-time work on dissertation research. Availability of such fellowships depends upon the receipt of grants or contracts by departmental faculty members.

Martin Luther King, Jr., Scholarships

Established in 1969 in memory of the late Rev. Martin Luther King, Jr., awards are made as openings occur to qualified minority graduate students who show financial need and are accepted to full-time study in the graduate schools of the University. Stipends cover tuition and all fees.

Appointments

Appointments to fellowships and assistantships are ordinarily announced no later than April 15 for the following academic year or summer. Appointments are for a maximum of three academic quarters and are not automatically renewed. Students who hold assistantships and research fellowships are expected to devote full time to their studies and the duties of the award. They may not accept outside employment without the consent of their faculty adviser and the Director of the Graduate School.

Dormitory Proctorships

A number of proctorships for men and women in dormitories on or near the Huntington Avenue Campus are available each year. Appointments carry a minimum compensation of room and board. Further information and applications may be obtained from the Office of University Housing.

Guaranteed Insured Loan Program

These loans are available through lending institutions in the applicant's home area. Under this program a student may borrow as much as $2,500 per academic year to a maximum indebtedness of $10,000. Repayment of principal and interest need not begin until nine months after the termination of studies.

The student must have submitted, through the College Scholarship Service, a Parents' Confidential Statement or, if he has been declared financially independent by the Financial Aid Office, a Student's Confidential Statement. These forms are available in the Financial Aid Office.

Applications for the loan itself are available from local banks or the Education Office of your state government. The Financial Aid Office has additional information and necessary application forms for Massachusetts residents.

National Direct Student Loan Program

This program is available to students who are carrying at least one half the normal academic load, are accepted as degree candidates, and show evidence of financial need.

The maximum amount which may be borrowed in any academic year is $2,500, and the total of the loans must not exceed $10,000.

Repayment and interest on these loans do not begin until nine months after the student ceases to carry at least a half-time academic load at an institution of higher education. The repayment of principal may be extended over a 10-year period with the interest at the rate of three percent per annum. Repayment may be deferred up to a total of three years while a borrower is serving as a Peace Corps or VISTA Volunteer.

Additional information and application forms are available from the Office of Financial Aid. The application deadline is September 1 for full-time students. For other students the deadline is six weeks prior to the start of the quarter for which aid is requested.

faculty

GRADUATE FACULTY

Professors

Arnold S. Goldstein, B.S. in Pharmacy, J.D., *Professor of Pharmacy Administration*

O. James Inashima, Ph.D., *Professor of Pharmacology and Acting Chairman, Department of Pharmacy and Pharmacy Administration*

Barry L. Karger, Ph.D., *Professor of Chemistry and Medicinal Chemistry and Director of the Institute of Chemical Analysis, Applications, and Forensic Science*

Helene A. Loux, Ph.D., M.T. (ASCP), *Associate Dean and Professor of Health Sciences*

John L. Neumeyer, Ph.D., *Professor of Medicinal Chemistry and Acting Chairman, Department of Medicinal Chemistry and Pharmacology*

Robert F. Raffauf, Ph.D., *Professor of Pharmacognosy and Medicinal Chemistry*

Albert H. Soloway, Ph.D., *Director of the Graduate School of Pharmacy and Allied Health Professions and Dean, College of Pharmacy and Allied Health Professions*

Elliot Spector, Ph.D., *Professor of Pharmacology*

John W. Webb, M.S., *Clinical Professor of Pharmacy*

Associate Professors

Andrew T. Canada, Ph.D., *Clinical Associate Professor of Pharmacy*

Michael A. Davis, D.Sc., *Clinical Associate Professor of Medicinal Chemistry*

William A. Gouveia, M.S., *Clinical Associate Professor of Pharmacy*

James J. Gozzo, Ph.D., *Associate Professor of Health Sciences*

Alun G. Jones, Ph.D., *Clinical Associate Professor of Medicinal Chemistry*

Britta L. Karlsson, M.S., M.T. (ASCP), *Associate Professor of Health Sciences (Medical Laboratory Science)*

Victor D. Warner, Ph.D., *Associate Professor of Medicinal Chemistry*

Assistant Professors

Judith Barr, M.Ed., M.T. (ASCP), *Assistant Professor of Health Sciences (Medical Laboratory Science)*

Jeffrey B. Blumberg, Ph.D., *Assistant Professor of Pharmacology*

Gerald L. Davis, M.T., Ph.D., *Assistant Professor of Health Sciences*

Catherine W. Hallsworth, M.S., M.T., (ASCP), *Assistant Professor of Health Sciences (Medical Laboratory Science)*

Bynum M. Jackson, Ph.D., M.T. (ASCP), *Assistant Professor of Health Sciences (Medical Laboratory Science)*
Jerome P. Janousek, M.S., *Clinical Assistant Professor of Pharmacy*
Donald S. Kosersky, Ph.D., *Assistant Professor of Pharmacology*
B. Susan Rogers, M.S., M.T. (ASCP), *Assistant Professor of Health Science (Medical Laboratory Science)*
Joseph M. Sceppa, M.S., *Clinical Assistant Professor of Pharmacy*
Richard T. Scheife, Pharm. D., *Clinical Assistant Professor of Pharmacy*
Leon D. Shargel, Ph.D., *Assistant Professor of Pharmacy and Pharmacology*
Albert H. Taubman, Ph.D., *Assistant Professor of Pharmacy Administration*

Adjunct Faculty

Khalid Butt, M.D., *Special Lecturer in Clinical Laboratory Science*
Howard Christian, M.D., *Special Lecturer in Clinical Laboratory Science*
Bradley Copeland, M.D., *Adjunct Professor of Health Sciences*
John F. Howes, Ph.D., *Lecturer in the Department of Medicinal Chemistry and Pharmacology*
Herbert L. Kayne, Ph.D., *Lecturer in Health Sciences*
Agnes Kim, M.D., *Special Lecturer in Clinical Laboratory Science*
George M. Krause, *Adjunct Professor of Pharmacy*
Manlio A. LoConte, M.D., *Lecturer in the Department of Medicinal Chemistry and Pharmacology*
Arnold Marglin, M.D., Ph.D., *Lecturer in Health Sciences*
Randi Rosvall, M.D., *Special Lecturer in Clinical Laboratory Science*
Andre Rosowsky, Ph.D., *Lecturer in the Department of Medicinal Chemistry and Pharmacology*

ADMINISTRATIVE POSITIONS

Albert H. Soloway, *Director of the Graduate School of Pharmacy and Allied Health Professions*
Carol M. Konis, *Administrative Assistant*
Michael A. Davis, *Director of the Master of Science Degree Program in Radiopharmaceutical Science*
Roger W. Giese, *Director of the Master of Science Degree Program in Clinical Chemistry*
James J. Gozzo, Ph.D., *Director of the Master of Science Degree Program in Medical Laboratory Science* (Effective July 1, 1976)
Helene A. Loux, *Director of the Master of Science Degree Program in Medical Laboratory Science*
John L. Neumeyer, *Director of the Doctor of Philosophy Degree Program in Medicinal Chemistry*
Robert F. Raffauf, *Director of the Master of Science Degree Program in Medicinal Chemistry*
John W. Webb, *Director of the Master of Science Program in Hospital Pharmacy*

fields of study

The sections that follow list degree programs and courses available to a student during the typical period of attendance required to obtain each degree. The place and time for which a specific course is offered may be found in the course announcement made available in May for the summer quarter and in June for the following academic year.

PART-TIME MASTER OF SCIENCE DEGREE PROGRAM IN CLINICAL CHEMISTRY

Objectives

At the present time, there is an acute shortage of trained people in clinical chemistry. This is especially critical in view of the increasing need for individuals with in-depth training in the chemical and biological sciences to direct clinical laboratory personnel.

Northeastern offers a part-time, evening Master of Science degree program in Clinical Chemistry under the joint sponsorship of the Department of Chemistry and the Graduate School of Pharmacy and Allied Health Professions. The program is available to people currently practicing clinical chemistry or those with appropriate backgrounds who wish to train for this field.

The development of this program came about through careful deliberation by members of the Departments of Chemistry, Medicinal Chemistry and Pharmacology, and Medical Laboratory Sciences. Thus, it is a truly interdisciplinary offering, representing a composite of the skills and knowledge of each of these disciplines. It is one of a series of graduate programs designed to meet the frequently expressed needs of clinical pathologists.

Admission and Program Features

The Admissions Committee for this program is composed of three faculty members: two from the Department of Medicinal Chemistry and Pharmacology and a third from Medical Laboratory Sciences. The Committee evaluates the background of the applicants, suggests course sequences, and informs the students of those offerings which will maximize their background in clinical chemistry.

For admission to this part-time M.S. degree program, the applicant must have completed a baccalaureate program in biology, chemistry, medical technology, pharmacy or a related field. Undergraduate requirements are: a minimum of two quarters of organic chemistry, two quarters of analytical chemistry, each with a laboratory or its equivalent, two quarters of human

physiology, and two quarters of physical chemistry. An individual who has deficiencies in any of these areas may take appropriate courses at Northeastern University concurrently with those graduate courses which do not require the deficient prerequisites. The appropriate evening courses offered at University College of Northeastern University are: Analytical Chemistry, 12.521 - 12.526; Organic Chemistry, 12.531 - 12.533; Physical Chemistry, 12.541 - 12.543; and Human Anatomy and Physiology, 18.524 - 18.526. Equivalent courses are accepted from this University or other accredited universities. Students admitted with deficiencies must remove them during the first 12 quarter hours of graduate work. By the completion of the degree requirements, students must have at least one year of acceptable clinical laboratory experience subsequent to attaining the appropriate baccalaureate degree.

Students in good standing in the program who lack this experience requirement may apply for an applied (training) course in clinical chemistry. This course is offered through the Graduate School of Pharmacy and Allied Health Professions of Northeastern University at one of the nearby affiliated hospitals and provides three months of this experience requirement. Individuals who have completed this course achieve an enhanced opportunity to obtain subsequent employment in this field and thereby satisfy the one year of experience requirement.

The program is available on a part-time basis, with courses offered primarily during the evening hours. Courses are scheduled in the fall, winter, spring, and summer quarters. It is anticipated that students may complete the degree requirements in a minimum of three years; however, the duration may sometimes be increased or decreased to satisfy the particular needs and requirements of the student. No research report or thesis is required.

Curriculum

Required Courses		*Credits*
12.821	Analytical Separations	2
12.823	Optical Methods of Analysis	2
72.834	Clinical Chemistry I	2
72.835	Clinical Chemistry II	2
72.837	Seminar and Report in Clinical Chemistry*	2
73.845	Radioisotopes in Biological Systems	2
87.807	Biometrics	2
87.810	Functions of the Human Systems	2
90.821	Biochemistry I	2
90.822	Biochemistry II	2
90.823	Biochemistry III	2
	QUARTER HOURS	22

*The first quarter of 72.837 is a required course; however, the course may be repeated twice as an elective.

Elective Core

A minimum of 12 credits must be taken from the following list:

12.822	Electroanalytical Chemistry	2
12.824	Special Topics in Analytical Chemistry I	2
12.825	Special Topics in Analytical Chemistry II	2
12.827	Computers in Chemistry	2
12.828	Chemical Instrumentation	2
72.836	Protein Analysis	2
72.837	Seminar and Report in Clinical Chemistry	2
72.861	CNS Depressants	2
72.862	Autonomic Drugs	2
72.863	Anti-infectives	2
72.864	Cancer Therapy and Carcinogenesis	2
72.865	Special Topics in Medicinal Chemistry	2
73.816	Concepts in Toxicology I	2
73.817	Concepts in Toxicology II	2
73.844	Drug Metabolism	2
87.811	Pathophysiology I	2
87.812	Pathophysiology II	2
87.833	Immunobiology	2
87.890	Seminar	1
90.824	Applications of Mass Spectrometry	2

Elective Courses

Taken with the approval of the Director of the M.S. program in Clinical Chemistry and the course instructor. Selection may be made from the above courses, as well as from the following and other appropriate graduate courses in the Graduate School of Pharmacy and Allied Health Professions or in the rest of the University.

11.871	Radiation Physics	2
11.872	Radiobiology	2
12.841	Inorganic Chemistry I	2
12.842	Inorganic Chemistry II	2
12.846	Coordination Chemistry	2
12.861	Advanced Organic Chemistry I	2
12.862	Advanced Organic Chemistry II	2
12.863	Physical Organic Chemistry	2
12.866	Spectrometric Identification of Compounds	2
12.881	Thermodynamics I	2
12.885	Atomic and Molecular Structure I	2
12.893	Kinetics	2
18.245	Serology-Immunology	3
18.840	Comparative Physiology of Regulatory Mechanisms	2
18.842	Vertebrate Endocrinology	2
18.843	Procedures in Endocrinology	3
18.860	Cell Biophysics and Biochemistry	5

18.909	Animal Virology	4
18.940	Microbial Biochemistry	4
72.837	Seminar and Report in Clinical Chemistry	2
72.815	Nuclear Medicine I	2
72.816	Nuclear Medicine II	2
72.817	Nuclear Medicine III	2
72.818	Nuclear Medicine IV	2
72.844	Seminar and Research Report in Radiopharmaceutical Science	2
72.866	Phytochemistry	2
73.814	Concepts in Pharmacology I	2
73.815	Concepts in Pharmacology II	2
73.818	Special Topics in Pharmacology	2
87.802	Advanced Medical Laboratory Science — Hematology and Immunohematology	4

A minimum total of 40 quarter hours of graduate credit is necessary for completion of the M.S. degree in Clinical Chemistry.

SAMPLE PROGRAM

MASTER OF SCIENCE IN CLINICAL CHEMISTRY

(Required Courses and Possible Electives)

YEAR 1

Fall Quarter

87.810	Functions of Human Systems	2
90.821	Biochemistry I	2

Winter Quarter

73.844	Drug Metabolism	2
90.822	Biochemistry II	2

Spring Quarter

12.823	Optical Methods of Analysis	2
90.823	Biochemistry III	2

YEAR 2

Fall Quarter

12.821	Analytical Separations	2
72.834	Clinical Chemistry I	2

Winter Quarter

12.822	Electroanalytical Chemistry	2
72.835	Clinical Chemistry II	2

Spring Quarter

72.836	Protein Analysis	2
73.845	Radioisotopes in Biological Systems	2

YEAR 3

Fall Quarter

12.827	Computers in Chemistry	2
87.807	Biometrics	2

Winter Quarter

72.837	Seminar and Report in Clinical Chemistry I	2
87.811	Pathophysiology I	2
	Elective	2

Spring Quarter

72.864	Cancer Therapy and Carcinogenesis	2
87.812	Pathophysiology II	2
87.833	Immunobiology	2

ELECTIVES

Fall Quarter

11.871	Radiation Physics	2
12.824	Special Topics in Analytical Chemistry I	2
12.827	Computers in Chemistry	2
12.861	Advanced Organic Chemistry	2
12.881	Thermodynamics I	2
72.863	Anti-infectives	2
72.866	Phytochemistry	2
73.814	Concepts in Pharmacology I	2
87.802	Advanced MLS Hematology and Immunohematology	4
87.890	Seminar	1

Winter Quarter

11.872	Radiobiology	2
12.822	Electroanalytical Chemistry	2
12.825	Special Topics in Analytical Chemistry II	2
12.828	Chemical Instrumentation	2
12.862	Advanced Organic Chemistry II	2
12.885	Atomic and Molecular Structure I	2
72.815	Nuclear Medicine I	2
72.817	Nuclear Medicine III	2
72.862	Autonomic Drugs	2
73.815	Concepts in Pharmacology II	2
73.816	Concepts in Toxicology I	2

Spring Quarter

12.825	Special Topics in Analytical Chemistry II	2
12.846	Coordination Chemistry	2
12.893	Kinetics I	2
72.816	Nuclear Medicine II	2
72.818	Nuclear Medicine IV	2
72.844	Seminar and Research Report in Radiopharmaceutical Science	2
72.861	CNS Depressants	2
73.817	Concepts in Toxicology II	2
87.812	Pathophysiology II	2

Summer Quarter

72.865	Special Topics in Medicinal Chemistry	2
90.824	Applications of Mass Spectrometry	2

PART-TIME MASTER OF SCIENCE DEGREE PROGRAM IN HOSPITAL PHARMACY

Objectives

Institutional pharmacy will constitute a major form of professional practice within the next decade. The pharmacist practicing in this environment must show proficiency in both the administrative and therapeutic spheres. The administrative need is essential, since the director of a hospital pharmacy must have managerial competence in order to direct personnel, determine budgets, interact with hospital administration and other departments, and establish guidelines and objectives for the pharmacy. It is his responsibility to determine the goals and the means for integrating the pharmacy into a high-quality health delivery system.

Additionally, he must be completely knowledgeable of the most modern therapeutic maneuvers, especially as they relate to the preparation and use of drugs. This is the pharmacist's area of expertise. The physician, nurse, and other medical personnel depend upon the modern pharmacist to counsel them in drug usage and selection, contraindication of drugs with specific disease conditions, and problems encountered with drug interactions. His guidance is essential and can only be based upon a comprehensive knowledge of therapeutics.

The function of this program is to prepare the modern pharmacist for such a career in institutional practice.

Admission and Program Features

The Director of the M.S. program in Hospital Pharmacy serves as Chairman of the Admissions Committee. The function of this Committee is to evaluate the background of the applicants and advise the Graduate Committee of their suitability for admission to the program. Additionally, the Director guides the graduate students in course selection and apprises them of those offerings which maximize their individual educational goals.

Admission as a matriculated graduate student is limited to those who possess a B.S. degree in Pharmacy (or an equivalent degree in Pharmacy) from an accredited college of pharmacy. The candidate must have demonstrated an ability to pursue graduate studies as evidenced by undergraduate transcripts and/or other evidence of scholarship.

The program is available on a part-time basis, with courses offered primarily during the evening hours. Courses are scheduled in the fall, winter, and spring quarters. It is anticipated that students may complete the degree requirements in a minimum of three years; however, the duration may in some cases be increased or decreased to satisfy the particular needs and requirements of the student. No research report or thesis is required.

Curriculum

The program contains a core curriculum of 12 quarter-hour credits of required courses and 12 quarter-hour credits to be selected from an elective core consisting of six hours of administrative courses and six hours of therapeutic courses. The total of the required and elective core components is 24 quarter hours of credit. In addition, 16 hours are to be selected from those graduate courses offered by divisions in the University. These latter courses are to be selected with the guidance of the Director of the M.S. program in Hospital Pharmacy.

Required Courses		*Credits*
71.815	Biopharmaceutics and Pharmacokinetics	2
71.822	Project Seminar and Report in Hospital Pharmacy	2
71.844	Hospital Pharmacy Administration I	2
71.845	Hospital Pharmacy Administration II	2
71.846	Hospital Pharmacy Administration III	2
71.854	Clinical Pharmacy	2
	QUARTER HOURS	12
Elective Core		
Administrative Core		
71.823	Legal Aspects/Federal Legislation in Pharmacy	2
71.852	Health Care Administration I	2
71.853	Health Care Administration II	2
71.855	Human Relations	2
71.856	Information Science in Hospital Pharmacy	2
	QUARTER HOURS	6
Therapeutic Core		
71.858	Contemporary Therapeutics I	2
71.859	Contemporary Therapeutics II	2
71.860	Drug Monitoring	2
71.861	Sterile Products	2
71.862	Hospital Preparations	2
	QUARTER HOURS	6
Total Required Courses and Elective Core		24
Electives		16
TOTAL PROGRAM *(quarter hours):*		40

Elective Courses

Taken with the approval of the Director of the M.S. program in Hospital Pharmacy and the course instructor. No more than 10 quarter hours of credit may be taken from programs other than those offered by the Graduate School of Pharmacy and Allied Health Professions.

5.860	Health Care Organization and Management	2
5.913	Data Processing	2
21.840	Sociology of Medicine	3
21.850	Sociology of Occupations and Professions	3
22.868	Politics and Health Care Administration	3
39.9H1	Economics of Medical Care and Health Manpower	3
41.811	Financial and Managerial Accounting	3
41.816	Management Control of Health Service Systems	3
43.814	Consumer Behavior	3
45.811	Purchasing and Materials Management	3
45.816	Organizational Behavior I	3
45.817	Organizational Behavior II	3
45.824	Organizational Behavior in a Nonprofit Environment	3
45.833	Operations Management in the Health Care System	3
45.838	Policy Formation in Health Care	3
45.951	Executive Development	3
45.972	Labor Relations	3
45.977	Information Systems for Health Care Facilities	3
45.978	Regulation and the American Health Care Industry	3
45.979	Integrative Models in Health Care	3
50.807	Abnormal Psychology	4
63.814	Grantsmanship	4
71.816	Clinical Pharmacokinetics	2
72.834	Clinical Chemistry I	2
72.835	Clinical Chemistry II	2
73.814	Concepts in Pharmacology I	2
73.815	Concepts in Pharmacology II	2
73.816	Concepts in Toxicology I	2
73.817	Concepts in Toxicology II	2
73.844	Drug Metabolism	2
73.845	Radioisotopes in Biological Systems	2
87.811	Pathophysiology I	2
87.812	Pathophysiology II	2

SAMPLE PROGRAM

MASTER OF SCIENCE IN HOSPITAL PHARMACY

YEAR 1

Fall Quarter

71.844	Hospital Pharmacy Administration	2
71.854	Clinical Pharmacy	2

Winter Quarter

71.845	Hospital Pharmacy Administration II	2
71.858	Contemporary Therapeutics I	2

Spring Quarter

71.846	Hospital Pharmacy Administration III	2
71.859	Contemporary Therapeutics II	2

Summer Quarter

71.822	Project Seminar and Research Report in Hospital Pharmacy	2

YEAR 2

Fall Quarter

71.852	Health Care Administration I	2
71.860	Drug Monitoring	2

Winter Quarter

71.853	Health Care Administration	2
71.861	Sterile Products	2

Spring Quarter

71.855	Human Relations	2
71.862	Hospital Preparations	2

YEAR 3

Fall Quarter

71.815	Biopharmaceutics and Pharmacokinetics	2
71.823	Legal Aspects/Federal Legislation in Pharmacy	2

Winter Quarter

71.856	Information Science in Hospital Pharmacy	2
	Electives	4

Spring Quarter

	Electives	6

ELECTIVES

Fall Quarter

5.860	Health Care Organization and Management	2
41.816	Management Control of Health Service Systems	3
72.834	Clinical Chemistry I	2
63.814	Grantsmanship	4
73.814	Concepts in Pharmacology I	2

Winter Quarter

39.9H1	Economics of Medical Care and Health Manpower	2
72.835	Clinical Chemistry II	3
73.815	Concepts in Pharmacology II	2
73.816	Concepts in Toxicology I	4
73.844	Drug Metabolism	2
87.811	Pathophysiology I	2

Spring Quarter

71.816	Clinical Pharmacokinetics	2
73.845	Radioisotopes in Biological Systems	2
73.817	Concepts in Toxicology II	2
87.812	Pathophysiology II	2

Summer Quarter

5.913	Data Processing	3
45.838	Policy Formation in Health Care	2

PART-TIME MASTER OF SCIENCE DEGREE PROGRAM IN MEDICAL LABORATORY SCIENCE

Objectives

This program provides opportunity for medical laboratory scientists to acquire increased expertise in laboratory science and in clinical laboratory research and development.

The graduate of this program will contribute significantly to the modern medical laboratory. He should be able to search the literature to find and test available methodologies, and to develop, modify, and evaluate new methods. He should be a qualified associate in the clinical pathology department. The graduate courses in administration and education prepare the student for administrative or teaching responsibilities required in medical laboratory supervisory or educative positions.

Admission and Program Features

To be enrolled for graduate work, the applicant must hold a baccalaureate degree from a recognized institution and provide evidence that he is able to pursue a program of graduate study as determined by the Graduate Committee. His scholastic record must show distinction, with adequate preparation in the sciences, including one year of organic chemistry, college physics, and mathematics; one complete course of analytical chemistry; and a minimum of 24 quarter hours or the equivalent of biological sciences including basic microbiology, human physiology, genetics, and cell biology. Requirements in human physiology, genetics, and cell biology may be completed at the graduate level. Students admitted with deficiencies must remove them during the first 20 quarter hours of graduate work.

Acceptance to the school is upon recommendation of the Medical Laboratory Science Graduate Committee and approval by the Graduate Committee of the Graduate School of Pharmacy and Allied Health Professions. It is anticipated that students may complete the degree requirements in a minimum of three years. However, in some cases this may be increased or decreased to satisfy a student's particular needs and requirements.

Professional Requirement

At the completion of the Master of Science degree, the student must have written, or be eligible to write, the examination in medical technology or in one of the categorical or specialist certifications of the Board of Registry of the American Society of Clinical Pathologists. Students intending to complete their professional requirements in an approved hospital school of medical technology must also make direct application to the hospital program. Acceptance to the graduate program in medical laboratory science does not imply concomitant acceptance to a hospital program.

Curriculum

The program contains a core curriculum of 27 quarter-hour credits of required courses and eight quarter-hour credits selected from an elective core. In addition, eight hours are to be selected from those graduate courses offered by the Graduate School of Pharmacy and Allied Health Professions or by other divisions in the University. These latter courses are to be selected with the guidance of the Director of the M.S. program in Medical Laboratory Science. A total of 43 quarter hours of academic work are required for this program.

In addition to the required course 87.990 Research Report I, each student working toward the degree of Master of Science in Medical Laboratory Science may elect to take either 87.991 Research Report II (2-4 quarter hours of credit) or 87.992 MLS Thesis (6 quarter hours of credit). After initial election of either 87.991 or 87.992, students must register for the selected course each quarter until work is completed. Grades for 87.990, 87.991 and 87.992 are recorded as Satisfactory or Unsatisfactory. Two unsatisfactory grades result in the student's dismissal from the thesis portion of the program.

The research report may take the form of a comprehensive, critical review of the literature in a specialized area and/or a specific program of experimental work on a single topic. If experimental work has been elected for Research Report II, it may be expanded later, with the permission of the student's research advisor, into a master's thesis with a topic, advisor and committee composed of not less than three members. Research Report II will culminate in a comprehensive, well-written report which must be reviewed by three faculty members. MLS Thesis will culminate in a final oral examination.

A comprehensive examination is required of all students, except those presenting a thesis. This exam will be offered once yearly on a pass/fail basis. Students failing the examination are given one opportunity to remove this failure.

Required Courses		*Credits*
87.801	Advanced Medical Laboratory Science — Pathogenic Microbiology	4
87.802	Advanced Medical Laboratory Science — Hematology and Immunohematology	4
87.805	Advanced Medical Laboratory Science — Chemistry and Instrumentation	4
87.807	Biometrics	2
87.811	Pathophysiology I	2
87.812	Pathophysiology II	2
87.990	Graduate Research Report I	2
90.821	Biochemistry I	2
90.822	Biochemistry II	2
	Seminars (3): 1 quarter hour each (87.890 or from other graduate programs)	3
	QUARTER HOURS	27

Students who are registered M.T. (ASCP) and who have completed the equivalent of 87.801, 87.802 and 87.805 within the previous five years, and are currently working in the speciality, should petition to substitute appropriate graduate science courses. Approval of advisor is required.

Elective Core

A minimum of eight credits must be taken from the following list:

18.240	Microbial Physiology	4
73.814	Concepts in Pharmacology I	2
73.815	Concepts in Pharmacology II	2
73.845	Radioisotopes in Biological Systems	2
87.821	Medical Laboratory Management I	2
87.826	Health Science Education I	2
87.832	Hematology I	2
87.833	Immunobiology	2
87.845	Epidemiology	2
87.858	Cellular Pathology	2
90.823	Biochemistry III	2

Elective Courses

Selection may be made from other courses in the electives core or from the following. Students may choose all electives in one area; i.e., the laboratory sciences, health science education, or laboratory administration.

18.211	Parasitology	4
18.242	Medical Microbiology	2
18.245	Serology — Immunology	3
18.246	Serology — Immunology Laboratory	2
18.903	Environmental Microbiology	4
18.905	Marine Microbiology	4
18.907	Food Microbiology	2
18.909	Animal Virology	4
18.910	Microbial Genetics	3
18.915	Medical Mycology	2
18.940	Microbial Biochemistry	4
19.838	Human Learning and Cognition	3
21.840	Sociology of Medicine	3
21.843	Sociology of Education	3
21.847	Formal Organizations	3
21.850	Sociology of Occupations and Professions	3
21.910	The Sociology of Science	3
22.876	Administrative Behavior	3
22.879	Science, Technology and the Administration of Public Policy	3
39.9G7	Public Policy in Manpower	3

SAMPLE PROGRAM
MASTER OF SCIENCE IN MEDICAL LABORATORY SCIENCE

YEAR 1

Fall Quarter			*Winter Quarter*			*Spring Quarter*		
87.802	Advanced MLS Hematology and Immunohematology	4	87.805	Advanced MLS Clinical Chemistry	4	87.801	Advanced MLS Pathogenic Microbiology	4
				Elective (i.e. 87.803)	2		Elective (i.e. 87.804)	2

YEAR 2

Fall Quarter			*Winter Quarter*			*Spring Quarter*		
87.807	Biometrics	2	87.811	Pathophysiology I	2	87.812	Pathophysiology II	2
90.821	Biochemistry I	2	90.822	Biochemistry II	2	87.890	Seminar	2
							Elective	1

YEAR 3

Fall Quarter			*Winter Quarter*			*Spring Quarter*		
87.990	Graduate Research Report I	2	87.890	Seminar	1		Elective	2
	Elective	2		Elective	2		Elective	2
	Seminar	1		Elective	2			

ELECTIVES

Fall Quarter

18.211	Parasitology	4
18.910	Microbial Genetics	3
18.909	Animal Virology	4
50.815	Research Design in Education	2
72.834	Clinical Chemistry I	2
72.863	Anti-infectives	2
87.802	Advanced MLS Hematology and Immunohematology	2
87.803	Medical Immunology and Serology	2
87.807	Biometrics	2
87.810	Functions of the Human Systems	2
87.826	Health Science Education I	2
87.990	Graduate Research Report I	2
87.991	Graduate Research Report II	2-4

Summer Quarter

18.903	Environmental Microbiology	4
18.905	Marine Microbiology	4
50.815	Research Design in Education	2
87.817	Immunohematology Administration	4
87.818	Transfusion Therapy	4
87.990	Graduate Research Report I	2
87.991	Graduate Research Report II	2-4

Winter Quarter

18.211	Parasitology	4
18.242	Medical Microbiology	2
18.245	Immunology and Serology	3
18.246	Immunology and Serology Laboratory	2
39.9H1	Economics of Medical Care and Health Manpower	3
50.815	Research Design in Education	2
50.817	Research Problems in Education	2
71.852	Health Care Administration I	2
72.835	Clinical Chemistry II	2
73.816	Concepts in Toxicology I	2
73.844	Drug Metabolism	2
87.804	Medical Parasitology	2
87.805	Advanced MLS Clinical Chemistry and Instrumentalism	4
87.811	Pathophysiology I	2
87.813	Genetic and Immunological Aspects of Blood Group Identification	2
87.814	Principles and Foundations of the Blood Group Syst.	4
87.821	Medical Laboratory Management I	2
87.827	Health Science Education II	2
87.845	Epidemiology	2
87.990	Graduate Research Report I	2
87.991	Graduate Research Report II	2-4

Spring Quarter

18.903	Environmental Microbiology	4
18.905	Marine Microbiology	4
18.907	Food Microbiology	2
18.915	Medical Mycology	2
18.940	Microbial Biochemistry	4
19.838	Human Learning and Cognition	3
21.840	Sociology of Medicine	3
22.876	Administrative Behavior	3
39.9G7	Public Policy in Manpower	3
50.815	Research Design in Education	2
71.853	Health Care Administration II	2
72.864	Cancer Therapy and Carcinogenesis	2
73.817	Concepts in Toxicology II	2
73.818	Special Topics in Pharmacology	2
87.801	Advanced MLS Pathogenic Microbiology	4
87.812	Pathophysiology II	2
87.815	The Design and Problems of Compatibility Testing	3
87.816	Principles of Hematology and Coagulation Related to Transfusion	3
87.822	Medical Laboratory Management II	2
87.828	Health Science Education III	2
87.833	Immunobiology	2
87.843	Immunobiology Laboratory	2
87.990	Graduate Research Report I	2
87.991	Graduate Research Report II	2-4
90.823	Biochemistry III	2

39.9H1	Economics of Medical Care and Health Manpower	3
39.9H3	Economics of Education	3
50.815	Research Design in Education	2
50.817	Research Problems in Education	2
71.852	Health Care Administration I	2
71.853	Health Care Administration II	2
71.855	Human Relations	2
72.834	Clinical Chemistry I	2
72.835	Clinical Chemistry II	2
72.863	Anti-infectives	2
72.864	Cancer Therapy and Carcinogenesis	2
73.816	Concepts in Toxicology I	2
73.817	Concepts in Toxicology II	2
73.818	Special Topics in Pharmacology	2
73.844	Drug Metabolism	2
87.803	Medical Immunology and Serology	2
87.804	Medical Parasitology	2
87.810	Functions of the Human Systems	2
87.813	Genetic and Immunological Aspects of Blood Group Identification	2
87.814	Principles and Foundations of the Blood Group Systems	3
87.815	The Design and Problems of Compatibility Testing	2
87.816	Principles of Hematology and Coagulation Related to Transfusion	3
87.817	Immunohematology Administration	4
87.818	Transfusion Therapy	4
87.822	Medical Laboratory Management II	2
87.823	Immunohematology	2
87.827	Health Science Education II	2
87.828	Health Science Education III	2
87.842	Hematology II	2
87.843	Immunobiology Laboratory	2
87.852	Hematology III	2
87.991	Graduate Research Report II	2-4
87.992	MLS Thesis	6
90.823	Biochemistry III	2

PART-TIME MASTER OF SCIENCE DEGREE PROGRAM IN MEDICINAL CHEMISTRY

Objectives

The primary goal of this program is the education of professionals interested in the following areas: the rational development, isolation, and analysis of drugs; the understanding of the chemical mechanisms by which these compounds function in mammalian systems; and the metabolism of such biologically active agents. For this purpose the program is composed of four distinct areas of study: medicinal chemistry, pharmacology and toxicology, biochemistry, and organic chemistry. This type of background gives preparation to an individual interested in using chemistry for biological and clinical purposes. The medical research team needs scientists with this training and orientation.

Admission and Program Features

Application for admission to this program is welcomed from any individual who has obtained a baccalaureate degree in pharmacy, chemistry, biology, and related programs within the biological or physical sciences from a recognized institution. Further, his undergraduate record must indicate a high level of previous work and sufficient background in organic chemistry, mathematics, and biology. Applicants with deficiencies in these areas may be admitted as Special Students. Students admitted with deficiencies must remove them during the first 12 quarter hours of graduate work.

The program is available on a part-time basis, with courses offered primarily during the evening hours. Courses are scheduled in the fall, winter, spring, and summer quarters. It is anticipated that students may complete the degree requirement in a minimum of three years; however, in some cases the duration may be increased or decreased to satisfy the particular needs and requirements of the student. No research report or thesis is required.

The Graduate School recognizes the divergent backgrounds and goals of individuals who may be accepted into this program. Accordingly, the program is designed to offer flexibility in course selection so as to maximize its relevance to the student's career objective.

General Requirements

A candidate must complete a minimum of 40 quarter hours of graduate work. A total of 24 required credits must be taken: 10 quarter hours of medicinal chemistry courses, six quarter hours of pharmacology and toxicology, four quarter hours of biochemistry and related areas, and four quarter hours of organic chemistry. The balance of 40 hours may be taken from an elective list.

An individual who has deficiencies in any of the areas required for admission may take appropriate courses at Northeastern University concurrently with those graduate courses which do not require the deficient prereq-

uisites. The appropriate evening courses offered at University College of Northeastern University are: Analytical Chemistry 12.521-12.526; Organic Chemistry 12.531 - 12.533; Physical Chemistry 12.541-12.543; and Human Anatomy and Physiology 18.524-18.526. Equivalent courses from this University or other accredited universities will be accepted.

Curriculum

Required Courses		*Minimum Credits*
1. Medicinal Chemistry from the following courses:		8 quarter hours
72.861	CNS Depressants	2
72.862	Autonomic Drugs	2
72.863	Anti-infectives	2
72.864	Cancer Therapy and Carcinogenesis	2
72.865	Special Topics in Medicinal Chemistry	2
72.866	Phytochemistry	2
2. Pharmacology and Toxicology from the following courses:		6 quarter hours
73.814	Concepts in Pharmacology I	2
73.815	Concepts in Pharmacology II	2
73.816	Concepts in Toxicology I	2
73.817	Concepts in Toxicology II	2
73.818	Special Topics in Pharmacology	2
3. Biochemistry, Clinical Chemistry, and Drug Metabolism from the following courses:		4 quarter hours
72.834	Clinical Chemistry I	2
72.835	Clinical Chemistry II	2
73.844	Drug Metabolism	2
90.821	Biochemistry I	2
90.822	Biochemistry II	2
90.823	Biochemistry III	2
4. Organic Chemistry from the following courses:		4 quarter hours
12.861	Advanced Organic Chemistry I	2
12.862	Advanced Organic Chemistry II	2
12.863	Physical Organic Chemistry	2
12.864	Stereochemistry I	2
12.865	Stereochemistry II	2
12.866	Spectrometric Identification of Organic Compounds	2
12.876	Mechanisms of Organic Reactions I	2
12.877	Mechanisms of Organic Reactions II	2
5. 72.867	Medicinal Chemistry Seminar	2 quarter hours
	TOTAL CREDITS	24

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SAMPLE PROGRAM
MASTER OF SCIENCE IN MEDICINAL CHEMISTRY

YEAR 1

Fall Quarter			*Winter Quarter*			*Spring Quarter*		
12.861	Advanced Organic Chemistry I	2	12.862	Advanced Organic Chemistry II	2	12.863	Advanced Organic Chemistry III	2
72.863	Anti-infectives	2	72.862	Autonomic Drugs	2	72.861	CNS Depressants	2

Summer Quarter

72.867	Medicinal Chemistry Seminar	2

YEAR 2

Fall Quarter			*Winter Quarter*			*Spring Quarter*		
72.866	Phytochemistry	2	72.865	Special Topics in Medicinal Chemistry	2	72.864	Cancer Therapy and Carcinogenesis	2
73.814	Concepts in Pharmacology I	2	73.815	Concepts in Pharmacology II	2	73.818	Special Topics in Pharmacology	2
90.821	Biochemistry I	2	90.822	Biochemistry II	2	90.823	Biochemistry III	2

YEAR 3

Fall Quarter			*Winter Quarter*			*Spring Quarter*		
	Elective	2	73.816	Concepts in Toxicology I	2	73.817	Concepts in Toxicology II	2
			73.844	Drug Metabolism	2			

ELECTIVES

Fall Quarter			*Winter Quarter*			*Spring Quarter*		
12.821	Analytical Separations	2	18.835	Mammalian Physiology	4	12.823	Optical Methods of Analysis	2
12.827	Computers in Chemistry	2	18.860	Cell Biophysics and Biochemistry	5	12.846	Coordination Chemistry	2
18.842	Vertebrate Endocrinology	2	72.812	Advanced Drug Synthesis	3	18.840	Comparative Physiology of Regulatory Mechanisms	2
18.909	Animal Virology	4				18.843	Procedures in Endocrinology	3
87.807	Biometrics	2				18.242	Medical Microbiology	4
						18.905	Marine Microbiology	4
Summer Quarter						18.940	Microbial Biochemistry	4
72.865	Special Topics in Medicinal Chemistry	2				72.836	Special Topics in Clinical Chemistry	2
90.824	Applications of Mass Spectrometry	2				73.845	Radioisotopes in Biological Systems	2

Elective Courses

Taken with the approval of the Director of the M.S. program in Medicinal Chemistry. Selection may be made from the above courses or other appriopriate graduate courses in the Graduate School of Pharmacy and Allied Health Professions or in the University.

		16 quarter hours
12.821	Analytical Separations	2
12.823	Optical Methods of Analysis	2
12.827	Computers in Chemistry	2
12.846	Coordination Chemistry	2
18.242	Medical Microbiology	4
18.835	Mammalian Physiology	4
18.840	Comparative Physiology of Regulatory Mechanisms	2
18.842	Vertebrate Endocrinology	2
18.843	Procedures in Endocrinology	3
18.860	Cell Biophysics and Biochemistry	5
18.905	Marine Microbiology	4
18.909	Animal Virology	4
18.940	Microbial Biochemistry	2
72.812	Advanced Drug Synthesis	3
72.836	Special Topics in Clinical Chemistry	2
73.845	Radioisotopes in Biological Systems	2
87.807	Biometrics	2
90.824	Applications of Mass Spectrometry	2

A minimum total of 40 quarter hours is required for completion of the M.S. in Medicinal Chemistry.

PART-TIME MASTER OF SCIENCE DEGREE PROGRAM IN PHARMACOLOGY

Objectives

The pharmacologist is concerned with the discovery, testing, and perfecting of drugs and the study of how they act, especially in mammalian systems. With the increasing concern of pharmaceutical companies, hospitals, and research institutions for knowledge of the mechanisms by which drugs produce their effects, the role of the pharmacologically trained scientist is ever expanding. In the education of such an individual, a broad background in pharmacology, physiology, anatomy, instrumentation, and chemistry is essential. The goal of Northeastern's program is to meet this objective and to prepare individuals to make significant contributions in the many areas requiring pharmacological expertise.

Admission and Program Features

Application for admission as a graduate student is welcomed from any individual who has obtained a baccalaureate degree in pharmacy, chemistry, biology, or related programs within the biological or physical sciences from a recognized institution. Further, the applicant's undergraduate record must indicate sufficient background in organic chemistry, mathematics, and biology. However, applicants with deficiencies in these areas may be admitted as Special Students. Students admitted with deficiencies must remove them during the first 12 quarter hours of graduate work.

The program is available on a part-time basis, with courses offered primarily during the evening hours. Courses are scheduled in the fall, winter, spring, and summer quarters. It is anticipated that students may complete the degree requirements in a minimum of three years. However, the duration may be longer or shorter, depending upon the particular student. No research report or thesis is required.

The Graduate School recognizes the divergent background and goals of individuals who may be accepted into this program. Accordingly, the program is designed to offer flexibility in course selection so as to maximize its relevance to the student's career objectives.

General Requirements

A candidate must complete a minimum of 40 quarter hours of graduate work. A total of 24 required credits must be taken: 16 quarter hours within the Pharmacology sequence and eight quarter hours from the Chemistry sequence. The balance of the 40 quarter hours may be selected from graduate courses in the Graduate School of Pharmacy and Allied Health Professions or in other divisions of the University. Selection of the elective courses should be made with the approval of the Director of the M.S. program in Pharmacology.

Curriculum

1. *Required Courses*		*Credits*
73.814	Concepts in Pharmacology I	2
73.815	Concepts in Pharmacology II	2
73.816	Concepts in Toxicology I	2
73.817	Concepts in Toxioclogy II	2
73.818	Special Topics in Pharmacology	2
* 73.826	Seminar and Report in Pharmacology I	2
73.835	Neuropharmacology	2

Continued on next page

*The first quarter of 72.826 is a required course; however, the course may be repeated twice as an elective (73.827 Seminar and Report in Pharmacology II and 73.828 Seminar and Report in Pharmacology III).

73.844	Drug Metabolism	2
87.807	Biometrics	2
87.810	Functions of the Human Systems (or equivalent)	2
90.821	Biochemistry I	2
90.822	Biochemistry II	2
		24 Q.H.

2. *Elective Courses*

18.835	Mammalian Physiology	4
18.840	Comparative Physiology of Regulatory Mechanisms	4
18.842	Vertebrate Endocrinology	2
18.843	Procedures in Endocrinology	3
18.909	Animal Virology	4
72.834	Clinical Chemistry I	2
72.835	Clinical Chemistry II	2
72.861	CNS Depressants	2
72.862	Autonomic Drugs	2
72.863	Anti-infectives	2
72.864	Cancer Therapy and Carcinogenesis	2
73.829	Experimental Pharmacology	3
73.845	Radioisotopes in Biological Systems	2
** 73.903	Thesis Preparation	2
87.811	Pathophysiology I	2
87.812	Pathophysiology II	2
87.833	Immunobiology	2
87.843	Immunobiology Laboratory	2
90.823	Biochemistry III	2
90.824	Applications of Mass Spectrometry	2

Additional electives may be selected from other appropriate graduate courses in the University with the approval of the Director of the M.S. program in Pharmacology and the course instructor.

**In certain circumstances an M.S. Thesis option may be elected by a student with the approval of the Director of the M.S. program in Pharmacology. Under this option, a student is required to develop, write and defend a research thesis in addition to the satisfactory completion of 32 quarter hours of graduate course work. The research may be carried out under appropriate supervision in one of the many research laboratories in the Boston area.

SAMPLE PROGRAM

MASTER OF SCIENCE IN PHARMACOLOGY

YEAR I

Fall Quarter			*Winter Quarter*			*Spring Quarter*		
73.814	Concepts of Pharmacology I	2	73.815	Concepts of Pharmacology II	2	73.835	Neuropharmacology	2
87.810	Functions of the Human Systems	2		Elective	2		Elective	2

YEAR II

Fall Quarter			*Winter Quarter*			*Spring Quarter*		
	Elective	2	73.816	Concepts of Toxicology I	2	73.826	Seminar & Report in Pharmacology	2
90.821	Biochemistry I	2	90.822	Biochemistry II	2	73.817	Concepts in Toxicology II	2

YEAR III

Fall Quarter			*Winter Quarter*			*Spring Quarter*		
87.807	Biometrics	2	72.844	Drug Metabolism	2	73.829	Experimental Pharmacology	2
	Elective	2	73.818	Special Topics in Pharmacology	2		Elective	2
				Elective	2		Elective	2
Summer Quarter								
72.865	Special Topics in Medicinal Chemistry	2						
90.824	Applications of Mass Spectrometry	2						

ELECTIVES

Fall Quarter			*Winter Quarter*			*Spring Quarter*		
18.842	Vertebrate Endocrinology	2	18.835	Mammalian Physiology	4	18.840	Comp. Phys. of Reg. Mech.	4
18.909	Animal Virology	4	72.835	Clinical Chemistry II	2	18.843	Procedures in Endocrinology	3
72.834	Clinical Chemistry I	2	72.862	Autonomic Drugs	2	72.861	CNS Depressants	2
72.863	Anti-infectives	2	87.811	Pathophysiology I	2	72.864	Cancer Therapy & Carcinogenesis	2
						73.829	Experimental Pharmacology	3
						73.845	Radioisotopes in Biolog. Systems	2
						87.812	Pathophysiology II	2
						87.833	Immunobiology	2
						87.843	Immunobiology Lab	2
						90.823	Biochemistry III	2
Summer Quarter								
72.865	Special Topics in Medicinal Chemistry	2						

PART-TIME MASTER OF SCIENCE DEGREE PROGRAM IN RADIOPHARMACEUTICAL SCIENCE

Objectives

During the last decade many new experimental tools and methods have been placed in the hands of professionals and practitioners in the allied health professions. These have been used to probe more widely and more deeply into the nature of man's clinical problems. Of all the new techniques, none has been employed in more diverse means nor yielded greater rewards than the use of radioactive isotopes for both diagnostic and therapeutic procedures.

There is a critical need for individuals with background and training in the area of radiopharmaceuticals and radiochemicals. They will be employed in the pharmaceutics industry, in hospitals, and in various clinical and chemical laboratories. The function of this program is to supply the in-depth knowledge necessary for the education of such professionals.

Admission and Program Features

Applicants for this program must have completed a baccalaureate program in pharmacy, biology, chemistry, medical technology, physics or a related field. Undergraduate requirements are: a minimum of two quarters of organic chemistry, one quarter of analytical chemistry or its equivalent, two quarters of human physiology, and one quarter of physics. An individual who has deficiencies in any of these areas may take appropriate courses at Northeastern University or at any other recognized institution concurrently with those graduate courses which do not require the deficient prerequisites. Students admitted with deficiencies must remove them during the first 12 quarter hours of graduate work.

The program is available on a part-time basis, with courses offered primarily during the evening hours. Courses are scheduled in the fall, winter, spring, and summer quarters. It is anticipated that students may complete the degree requirements in a minimum of three years; however, in some cases the duration may be increased or decreased to satisfy the particular needs and requirements of the student. No research or thesis is required but a research elective is available.

The Graduate Committee recognizes the divergent backgrounds and goals of individuals who may be accepted into this program. Accordingly, the program is designed to offer flexibility in course selection so as to maximize its relevance to the student's career objectives. Each student is assigned a faculty advisor who assists him in course selection and apprises him of those offerings which will strengthen his background in the areas of his interest. In essence, this advisor functions in tailor making the program for the student's individual needs.

Curriculum

Required Courses

		Credits
11.871	Radiation Physics	2
11.872	Radiobiology	2
72.815	Nuclear Medicine I: Instrumentation	2
72.816	Nuclear Medicine II: Instrumentation	2
72.817	Nuclear Medicine III: Radiopharmaceuticals	2
72.818	Nuclear Medicine IV: Radiopharmaceutical Laboratory	2
72.844	Seminar and Research Report in Radiopharmaceutical Science	2
72.847	Dosimetry and Health Physics	2
72.848	Clinical Aspects of Nuclear Medicine	2
72.849	Radiopharmacy Internship	2
87.807	Biometrics	2
90.821	Biochemistry I	2
	QUARTER HOURS	24

Elective Core

A minimum of 10 credits must be taken from the following list:

72.834	Clinical Chemistry I	2
72.835	Clinical Chemistry II	2
72.863	Anti-infectives	2
72.864	Cancer Therapy and Carcinogenesis	2
73.814	Concepts in Pharmacology I	2
73.815	Concepts in Pharmacology II	2
73.816	Concepts in Toxicology I	2
73.817	Concept in Toxicology II	2
73.844	Drug Metabolism	2
87.810	Functions of the Human Systems	2
87.811	Pathophysiology I	2
87.812	Pathophysiology II	2
90.822	Biochemistry II	2
90.823	Biochemistry III	2

Additional Electives

These are to be taken with the approval of a faculty advisor in the Department of Medicinal Chemistry and Pharmacology in the Graduate School of Pharmacy and Allied Health Professions and the course instructor. Selection may be made from the above courses, as well as from the following and from other appropriate graduate courses in the University. Course availability is subject to change.

12.841	Inorganic Chemistry I	2
12.842	Inorganic Chemistry II	2
12.846	Coordination Chemistry	2

SAMPLE PROGRAM
MASTER OF SCIENCE IN RADIOPHARMACEUTICAL SCIENCE

YEAR I

Fall Quarter			*Winter Quarter*			*Spring Quarter*		
11.871	Radiation Physics	2	11.872	Radiobiology	2	87.807	Biometrics or Elective	2
87.807	Biometrics or Elective	2	72.815	Nuclear Medicine I	2	72.816	Nuclear Medicine II	2

YEAR 2

Fall Quarter			*Winter Quarter*			*Spring Quarter*		
	Elective	2	72.817	Nuclear Medicine III	2	72.818	Nuclear Medicine IV	2
90.821	Biochemistry I	2		Elective	2	72.848	Clinical Aspects of Nuclear Medicine	2

YEAR 3

Fall Quarter			*Winter Quarter*			*Spring Quarter*		
72.847	Dosimetry and Health Physics	2	72.849	Internship or Elective	2	72.849	Internship or Elective	2
72.849	Internship or Elective	2	72.844	Seminar and Research Report	2		Elective	2

ELECTIVE

Fall Quarter			*Winter Quarter*			*Spring Quarter*		
12.841	Inorganic Chemistry I	2	12.828	Chemical Instrumentation	2	12.846	Coordination Chemistry	2
12.861	Advanced Organic Chemistry I	2	12.842	Inorganic Chemistry II	2	12.866	Spectrometric Identification of Compounds	2
18.842	Vertebrate Endocrinology	2	12.862	Advanced Organic Chemistry II	2	18.840	Comparative Physiology of Regulatory Mechanisms	2
72.834	Clinical Chemistry I	2	18.245	Serology-Immunology	3	18.843	Procedures in Endocrinology	3
72.863	Anti-infectives	2	18.835	Mammalian Physiology	4	18.861	Cell Biophysics and Biochemistry II	5
73.814	Concepts in Pharmacology I	2	18.860	Cell Biophysics and Biochemistry I	5	72.864	Cancer Therapy and Carcinogenesis	2
87.810	Function of the Human Systems	2	72.835	Clinical Chemistry II	2	73.817	Concepts in Toxicology II	2
			72.865	Special Topics in Medicinal Chemistry	2	73.818	Special Topics in Pharmacology	2
			73.815	Concepts in Pharmacology II	2	73.822	Pathology	2
			73.816	Concepts in Toxicology I	2	87.812	Pathophysiology II	2
			73.844	Drug Metabolism	2	87.833	Immunobiology	2
			87.805	Advanced MLS-Chemistry and Instrumentation	4	87.843	Immunobiology Laboratory	2
			87.811	Pathophysiology I	2	90.823	Biochemistry III	2
			90.822	Biochemistry II	2			

Summer Quarter		
72.867	Medicinal Chemistry Seminar	2

12.861	Advanced Organic Chemistry I	2
12.862	Advanced Organic Chemistry II	2
12.866	Spectrometric Identification of Compounds	2
18.245	Serology-Immunology	3
18.835	Mammalian Physiology	4
18.840	Comparative Physiology of Regulatory Mechanisms	2
18.842	Vertebrate Endocrinology	2
18.843	Procedures in Endocrinology	3
18.860	Cell Biophysics and Biochemistry I	5
18.861	Cell Biophysics and Biochemistry II	5
72.865	Special Topics in Medicinal Chemistry	2
73.818	Special Topics in Pharmacology	2
73.819	Pharmacological Instrumentation	2
73.822	Pathology	2
87.805	Advanced MLS-Chemistry and Instrumentation	4
87.833	Immunobiology	2
87.843	Immunobiology Laboratory	2

A minimum total of 40 quarter hours of graduate credit is necessary for completion of the Master of Science degree in Radiopharmaceutical Science.

FULL-TIME DOCTOR OF PHILOSOPHY DEGREE PROGRAM IN MEDICINAL CHEMISTRY

Objectives

The purpose of this program is to educate the research scientist interested in applying chemistry to the solution of biological and medical problems. Such research may take the form of synthesizing new drugs — both radioactive and nonradioactive — for diagnosis and a variety of disease conditions, determining metabolic products derived from compounds of an endogenous or exogenous origin, elucidating various biochemical pathways, developing and utilizing analytical methodologies for drugs and various biochemical compounds, and isolating drugs from natural sources. These are a few of the types of research projects which are available within the Department of Medicinal Chemistry and Pharmacology.

In addition to the student's demonstration of superior proficiency in original research, he must acquire the background knowledge via courses and outside reading in the current scientific literature in his area of specialization to complete the qualifying examination satisfactorily. For this purpose, a working knowledge of at least one foreign language is required. Any student who wishes to pursue the doctorate must write directly to the Director of the Ph.D. program.

Admission and Program Features

Application for admission is welcomed from any individual who has obtained a baccalaureate degree in pharmacy, chemistry, biology, medical laboratory science, and related programs within the biological or physical sciences from a recognized accredited institution. Further, the undergraduate record must indicate a very high level of previous work and sufficient background in organic chemistry, mathematics, and biology. Deficiencies in these areas must be removed within the first academic year. Admission to this program is by acceptance of the Graduate Committee. A student is considered to be in the doctoral program after being accepted, but not before taking up full-time residence.

Course Requirements

There are no specific course requirements beyond those which may be required for a master's degree, but in order for a student to be completely prepared for both the research program and the qualifying examination, an appropriate course background is desirable.

INTERDISCIPLINARY PH.D. PROGRAM IN FORENSIC CHEMISTRY

This program is being offered in conjunction with the Colleges of Criminal Justice and Northeastern University's Institute of Chemical Analysis, Applications and Forensic Science. This unique program in an area of societal need is designed as a preparation for research and leadership positions in forensic laboratories. The Graduate School of Pharmacy and Allied Health Professions is the registering department for specialization in forensic toxicology. Two other specializations, namely forensic analytical chemistry and forensic materials science are administered by the Chemistry Department in conjunction with the College of Criminal Justice. Admission is made through the registering department.

For students entering with a B.S., completion of the M.S. course requirements in Forensic Chemistry with a B average is required to qualify for further Ph.D. study. For students with M.S. degrees in forensic science or the natural sciences, individual programs are planned according to the student's background. The course of study includes comprehensive examinations, thesis research to be carried out at the Institute of Chemical Analysis, Applications and Forensic Science and a recommended internship at a major forensic laboratory engaged in research.

courses

DESCRIPTION OF COURSES

5.800 See Graduate School of Engineering Catalog

11.871 Radiation Physics (2 q.h.)
An introduction to the nucleus and modes of spontaneous radioactive transformation. The isotopic abundance of the elements, naturally occurring radioelements and decay series, the kinetics of decay and the relationship between mass and energy. The nature of the emitted radiation and its interaction with matter. *Prep. Undergraduate physics.*
Yearly, Fall Quarter

11.872 Radiobiology (2 q.h.)
The biological effects of ionizing radiation. Included is a discussion of elementary target theory, radiation chemistry, effects on macromolecules, cellular and chromosomal effects, recovery processes, and the acute and long-term effects of radiation with emphasis on man, as well as a discussion of environmental sources of radiation and the characteristics of internal and external human exposure. *Prep. 11.871.* Yearly, Winter Quarter

12.253 Identification of Organic Compounds (3 q.h.)
Qualitative analysis of organic compounds and mixtures, using physical, chemical, and instrumental methods. *Prep. 12.155.*
Yearly, Spring and Summer Quarters

12.500 See University College Catalog

12.821 Analytical Separations (2 q.h.)
Theory and practice of analytical separation techniques. Emphasis on fundamentals as they relate to practice. Topics based mainly on chromatographic processes, including gas and high-speed liquid chromatography. Other topics include: zone refining, liquid extraction, and electrophoresis. Yearly, Fall Quarter

12.822 Electroanalytical Chemistry (2 q.h.)
The principles and practice of electroanalytical chemistry. Topics include: potentiometry and ion-selective electrodes, normal and thin-layer coulometry, polarography, and electrochemical relaxation methods. Application of these techniques to titration endpoint detection.
Yearly, Winter Quarter

12.823 Optical Methods of Analysis (2 q.h.)
The theory and practice of absorption and emission spectroscopy. Instruments, methods, and applications are considered.
Yearly, Spring Quarter

12.824, 12.825, 12.826 Special Topics in Analytical Chemistry I, II, III (2 q.h.)
Selected topics of current importance in analytical chemistry.
Yearly, Fall, Winter, and Spring Quarters

12.827 Computers in Chemistry (2 q.h.)
A laboratory-lecture course illustrating the use of small digital computers for real-time control of chemical instruments. Topics include: digital logic, real-time data structures, A/D and D/A conversion, noise, and other aspects of real-time computer interfacing. Programming done on a PDP-11 computer in MIRACL, a language designed for real-time processing. *Prep. consent of instructor.*
Yearly, Fall Quarter

12.828 Chemical Instrumentation (2 q.h.)
Principles of instrument design considered, with emphasis on practical aspects. Instrument limitations and sources of error studied, along with modular instruments and interfacing. *Prep. consent of instructor.*
Yearly, Winter Quarter

12.861, 12.862 Advanced Organic Chemistry I, II (2 q.h.)
An intensive survey of organic reactions. Modern concepts of structure and mechanism are used to correlate factual material. *Prep. one year of Organic Chemistry.*
Yearly, Fall and Winter Quarters

12.863 Physical Organic Chemistry (2 q.h.)
Application of LCAO concepts, linear free energy relationships, interactions between solvent effects, steric considerations, and electronic factors, and introduction to orbital symmetry direction of concerted reactions. *Prep. 12.862 or consent of instructor.*
Yearly, Spring Quarter

12.864, 12.865 Stereochemistry I, II (2 q.h.)
Interrelation of steric arrangements of atoms in organic molecules with their physical and chemical properties. Conformational analysis. Spatial relationships between atoms and groups during chemical reactions and consequent effects on chemical equilibria and reaction rates as an introduction to the study of reaction mechanisms. *Prep. 12.863.*
Yearly, Fall and Winter Quarters

12.866 Spectrometric Identification of Organic Compounds (2 q.h.)
Interpretation of the ultraviolet, infrared, nuclear magnetic resonance and mass spectra of organic compounds. *Prep. one year of Organic Chemistry.*
Yearly, Spring Quarter

12.876, 12.877 Mechanisms of Organic Reactions I, II (2 q.h.)
Consideration of the fundamental factors influencing the course of a chemical reaction. Study of the effects of structural and environmental changes on the mechanisms of organic reactions. *Prep. 12.865.*
Yearly, Winter and Spring Quarters

12.800 See Graduate School of Arts and Sciences Catalog

18.200 See Undergraduate Catalog

18.240 Microbial Physiology (4 q.h.)
The biochemical changes brought about through microbial activities; measurement of metabolic biosynthesis and degradation, rates of reaction and determination of end products. *Prep. 18.220.*
Yearly, Fall and Winter Quarters

18.800 See Graduate School of Arts and Sciences Catalog

19.800 See Graduate School of Arts and Sciences Catalog

21.800 See Graduate School of Arts and Sciences Catalog

39.900 See Graduate School of Arts and Sciences Catalog

41.800 See Graduate School of Business Administration Catalog

45.800 See Graduate School of Business Administration Catalog

50.800 See Graduate School of Education Catalog

71.815 Biopharmaceutics and Pharmacokinetics (2 q.h.)
Treatment of the factors affecting drug availability from various dosage forms. Included is the influence of the route of administration and the dosage regimen on drug availability. Additionally, a quantitative treatment of dynamics of drug absorption, distribution, metabolism, and excretion, as well as the development of mathematical models for those processes, is considered. *Prep. admission to hospital pharmacy program.*
Yearly, Fall Quarter

71.816 Clinical Pharmacokinetics (2 q.h.)
Emphasis is placed upon application of various pharmacokinetic techniques in estimating dosage regimens, evaluating drug therapy, consulting on drug selection and assessment of bioavailability and bioequivalence data. *Prep. 71.815 or equivalent.* Yearly, Spring Quarter

71.822 Project Seminar and Report in Hospital Pharmacy (2 q.h.)
Seminar on current developments or specific problems in hospital phar-

macy which have been studied in depth by students with guidance from the graduate faculty. The student presentations may be alternated with guest speakers on topics of current interest. Student participation in the discussions is an essential objective of the course. *Prep. admission to hospital pharmacy program.* Yearly, Summer Quarter

71.823 Legal Aspects/Federal Legislation in Pharmacy (2 q.h.)
An analysis of the Federal and state laws relating to the distribution of drugs in the institution. Included are common law liabilities such as malpractice and other frequently encountered problems. *Prep. admission to hospital pharmacy program.* Yearly, Fall Quarter

71.844 Hospital Pharmacy Administration I (2 q.h.)
Administration of the pharmacy department in an institutional environment. Study of budgets, purchasing, and distribution procedures. Medium-scale production of preparations for dispensing. Personnel management, public relations, legal responsibilities, educational demands, professional communications, and general administrative function of a hospital pharmacist. *Prep. admission to hospital pharmacy program or consent of instructor.*
Alternate Years, Fall Quarter

71.845 Hospital Pharmacy Administration II (2 q.h.)
A continuation of 71.844 Hospital Pharmacy Administration I. *Prep. 71.844.*
Alternate Years, Winter Quarter

71.846 Hospital Pharmacy Administration III (2 q.h.)
A continuation of 71.845 Hospital Pharmacy Administration II. *Prep. 71.845.*
Alternate Years, Spring Quarter

71.852 Health Care Administration I (2 q.h.)
The socio-economics and statistics of health care, including governmental programs, legislative trends, third-party insurance and welfare programs, and other areas that may affect the management of the modern institutional pharmacy. *Prep. admission to the hospital pharmacy program or consent of instructor.* Alternate Years, Fall Quarter

71.853 Health Care Administration II (2 q.h.)
A continuation of 71.852 Health Care Administration I. *Prep. 71.852.*
Alternate Years, Winter Quarter

71.854 Clinical Pharmacy (2 q.h.)
The patient-oriented aspects of the application of therapeutic agents to hospital patients. An in-depth study of the relation of therapeutic regimens to laboratory tests and drug interactions. The role of the hospital pharmacist as an active member of the actual health-care team dealing directly with in-patients and out-patients. *Prep. admission to hospital pharmacy program or consent of instructor.* Alternate Years, Fall Quarter

71.855 Human Relations (2 q.h.)
A study of personnel psychology, organization structuring, wage and performance incentives, employee evaluations, and policy in relation to accepted personnel concepts and procedures. *Prep. admission to hospital pharmacy program or consent of instructor.*

Alternate Years, Spring Quarter

71.856 Information Science in Hospital Pharmacy (2 q.h.)
The terminology and operation of data processing systems, including hardware and software, is presented. An extensive review of past, present and future applications of data processing systems to institutional pharmacy practice is a major focus of this course. Systems design, evaluation and proposal development to administrators is discussed. *Prep. Admission to Hospital Pharmacy Program or Consent of Instructor.*

Yearly, Winter Quarter

71.858 Contemporary Therapeutics I (2q.h.)
Recent developments in current therapeutic approaches and their rationale in the treatment of cardiovascular, neurological, gastrointestinal, musculoskeletal, and metabolic diseases of a noninfectious nature. Therapy related to aging and selected genetic diseases. *Prep. 71.854.*

Alternate Years, Winter Quarter

71.859 Contemporary Therapeutics II (2 q.h.)
Current concepts of infectious diseases and the rationale for the chemotherapeutic treatment of these conditions. Diseases of the blood and blood-forming organs, neoplastic disease, and diseases related to deficiency states. *Prep. 71.854.* Alternate Years, Spring Quarter

71.860 Drug Monitoring (2 q.h.)
The process by which drugs are monitored to determine their effectiveness, safety, prevention of iatrogenic factors, drug-drug interactions, and matters affecting patient compliance with a therapeutic regimen. The utilization of this information in improving patient care. *Prep. 71.854.*

Alternate Years, Fall Quarter

71.861 Sterile Products (2 q.h.)
Theory, principles, methods, and techniques in preparing sterile, pyrogen- and particulate-free products. Equipment and laboratory design required for manufacturing different types of sterile products and the practical considerations essential for their production. *Prep. Microbiology.*

Yearly, All Quarters

71.862 Hospital Preparations (2 q.h.)
Therapeutic concepts, pharmaceutical problems, and methods of preparing various specialized clinical preparations and mixtures. These include: hyperalimentation solutions, dialysis solutions, cationic or anionic adjust-

ment solutions, irrigation solutions, pediatric preparations, reconstitution preparations, additive admixtures, and unit dose packaging. *Prep. admission to hospital pharmacy program.* Alternate Years, Spring Quarter

72.812 Advanced Drug Synthesis (3 q.h.)
Application of synthetic and analytical techniques to the formation of new drugs. *Prep. two quarters of Organic Chemistry with laboratory.*
Alternate Years, Winter Quarter

72.815 Nuclear Medicine I: Instrumentation (2 q.h.)
An introduction to nuclear detection techniques by both lecture and laboratory demonstration. All types of systems will be considered, including scintillation, ionization, gas and solid state detectors. Basic principles of spectrometry with an emphasis on sodium iodide detectors will be studied. *Prep. 11.871.* Yearly, Winter Quarter

72.816 Nuclear Medicine II: Instrumentation (2 q.h.)
A study of the application of nuclear detection techniques in the physical aspects of nuclear medicine. Current clinical instrumentation including gamma cameras and scanners, probes and whole body counters, as well as future developments such as the solid state and the multiwire proportional cameras, and positron and tomographic imaging devices. Principles of collimation are studied with each system. The application of computers in nuclear medicine. This course includes both lecture and laboratory demonstration and is a companion course to 72.815. *Prep. 11.871 and 72.815.* Yearly, Spring Quarter

72.817 Nuclear Medicine III: Radiopharmaceuticals (2 q.h.)
A study of the chemical and biological aspects of nuclear medicine. A discussion of the methods of radiopharmaceutical preparation and quality control, the use of the agent in organ imaging and as disease specific radiotracers. As well as *in vivo* nuclear medicine, *in vitro* tests will be considered, including radioimmunoassay and competitive binding assays. The therapeutic use of radioactive compounds will also be studied. *Prep. 72.815 and 72.816.* Yearly, Winter Quarter

72.818 Nuclear Medicine IV: Radiopharmaceutical Laboratory (2 q.h.)
Demonstrations and discussions of the preparation and quality control of radiopharmaceuticals derived from reactor, accelerator and generator produced radionuclides. Assay techniques for radiochemical, radionuclide and chemical purity. Regulatory implications in the handling and dispensing of radioactive drugs. This is a companion course to 72.817. *Prep. 72.817.*
Yearly, Spring Quarter

72.834 Clinical Chemistry I (2 q.h.)
Principles, instrumentation methodologies, and interpretations in clinical chemistry. *Prep. 90.823.* Yearly, Fall Quarter

72.835 Clinical Chemistry II (2 q.h.)
A continuation of Clinical Chemistry I. *Prep. 72.834.* Yearly, Winter Quarter

72.836 Protein Analysis (2 q.h.)
Laboratory (preparations, analyses, interpretations), lecture, and discussion (current journal articles) of electrophoretic and immunochemical methods of analysis for proteins of clinical and forensic interest. *Prep. 72.835.* Yearly, Spring Quarter

72.837, 72.838, 72.839 Seminar and Report in Clinical Chemistry I, II, III (2-6 q.h.)
Reports and discussions of current journal articles in clinical chemistry. *Prep. 72.835.* Yearly, Winter Quarter

72.844 Seminar and Research Report in Radiopharmaceutical Science (2 q.h.)
This course is designed to familiarize the student with literature sources and the latest developments in radiopharmaceutical science. A written and oral presentation will be required in a particular area as evidence of an ability to organize and evaluate published material. *Prep. 72.816.*
Yearly, Winter Quarter

72.847 Dosimetry and Health Physics (2 q.h.)
Review of radiation units and measures of dose. Emphasis will be on the calculation of absorbed dose to the human body from gamma and beta emitters using MIRD pamphlets. Also discussed will be the health physics aspects of nuclear medicine including radiation protection, shielding design and instrumentation. *Prep. 72.816.* Yearly, Fall Quarter

72.848 Clinical Aspects of Nuclear Medicine (2 q.h.)
The current practice of diagnostic nuclear medicine in both large medical centers and small community hospitals will be discussed. The effect of pathology in the distribution of radiopharmaceuticals will be considered on an organ and disease basis and illustrated with actual patient findings. The techniques employed in imaging the various organs and body compartments will be presented. Factors influencing the decision to perform a diagnostic nuclear medicine procedure and the choice of the agent to be employed will be discussed. *Prep. 72.818.* Yearly, Spring Quarter

72.849 Radiopharmacy Internship (2 q.h.)
This is designed as a practical on-site introduction to the use of radiopharmaceuticals in the clinical environment. The student will participate in all normal functions of a radiopharmacy. Operations such as ordering, preparation, dispensing and distribution of radiodiagnostics, manufacture of non-routine agents and quality control procedures and record keeping.

This is considered a laboratory course. Arrangements will be made on an individual basis and the site of the radiopharmacy will be by approval of the instructor. Offered in all quarters, registration will take place during the Spring quarter only. *Prep. 72.818.* Yearly, All Quarters

72.850 Medicinal Chemistry Colloquium (2 q.h.)
Oral presentations by the participants on current research in medicinal chemistry and related areas in pharmacy. Included will be the theoretical basis of the problem as well as experimental results obtained. *Prep. Ph.D. Candidate.* Yearly, All Quarters

72.861 CNS Depressants (2 q.h.)
Presentation and discussion of the chemistry, structure-activity relationships, and mechanism of action of general anesthetics, hypnotics and sedatives, antiepileptics, analgetics, tranquilizers, and muscle relaxants. A consideration of the mechanics of drug design and methods of modification is undertaken. *Prep. two quarters of Organic Chemistry.*
Alternate Years, Spring Quarter

72.862 Autonomic Drugs (2 q.h.)
A discussion of drugs acting on the central nervous system, with special emphasis on the action mechanism of the chemical mediators of the peripheral nervous system. The role of the agents affecting this system — adrenergic and cholinergic and reversible and irreversible inhibitors of these systems — is discussed in relation to their chemical structure and biological activity. *Prep. two quarters of Organic Chemistry.*
Alternate Years, Winter Quarter

72.863 Anti-Infectives (2 q.h.)
A study of the various chemotherapeutic agents employed in the treatment of infectious diseases. Included are: the sulfonamides, antibiotics, antivirals; antitubercular, antifungal, and antimalarial agents. Special emphasis is on structure-activity relationships, mechanisms of action, and modern research in each area. *Prep. two quarters of Organic Chemistry.*
Alternate Years, Fall Quarter

72.864 Cancer Therapy and Carcinogenesis (2 q.h.)
Recent developments in new approaches to both carcinogenesis and to the treatment of cancer are considered, including alkylating agents, antimetabolites, hormones, miscellaneous compounds, and combinations of the above with radiation and immunology. Possible mechanisms of carcinogenesis and chemotherapeutic action explored. *Prep. two quarters of Organic Chemistry.* Alternate Years, Spring Quarter

72.865 Special Topics in Medicinal Chemistry (2 q.h.)
A consideration of a special area of medicinal chemistry, including either steroids, CNS compounds, pharmacodynamic agents or chemotherapeutics; their chemistry and structure. *Prep. two quarters of Organic Chemistry.* Alternate Years, Summer and Winter Quarters

72.866 Phytochemistry (2 q.h.)
The important classes of chemical compounds produced by plants considered from the standpoint of their biogenetic origin, detection, isolation, and characterization. Application of these techniques to research in pharmacy, medicine, economics, botany, taxonomy. Introduction to the literature of plant chemistry. *Prep. two quarters of Organic Chemistry and two quarters of Biology.* Alternate Years, Fall Quarter

72.867 Medicinal Chemistry Seminar (2 q.h.)
Selection and discussion of pertinent articles in the very recent medicinal chemistry literature carried out by faculty and students. Background and the basis for this research discussed. *Prep. two quarters of Organic Chemistry.* Yearly, Summer Quarter

73.814 Concepts in Pharmacology I (2 q.h.)
In-depth coverage of the fundamental principles of pharmacology. The course will cover pharmacodynamics, including dose-effect relationships and drug-receptor interactions. Pharmacokinetic concepts, including absorption, distribution, and elimination will be presented as well as common pathways of drug metabolism. Other topics to be discussed include pharmacogenetics, drug resistance, tolerance and physical dependence. An overview of experimental and clinical drug evaluation in man will be presented. The course is intended as a necessary prerequisite for succeeding courses in pharmacology and toxicology. *Prep. Admission to a graduate department or approval of the instructor.* Yearly, Fall Quarter

73.815 Concepts in Pharmacology II (2 q.h.)
Continuation of Concepts in Pharmacology I. *Prep. 73.814.*
Yearly, Winter Quarter

73.816 Concepts in Toxicology I (2 q.h.)
An overview of toxicology describing the elements of method and approach that identify the science. Special emphasis will be placed on the systemic site of action of toxicants. The intent of this part of the course is to provide answers to two questions: 1) What kinds of injury are produced in specific organs or systems by toxic agents? 2) What are the agents that produce these effects? *Prep. 73.814* Yearly, Winter Quarter

73.817 Concepts in Toxicology II (2 q.h.)
Continuation of Concepts in Toxicology I. *Prep. 73.816.*
Yearly, Spring Quarter

73.818 Special Topics in Pharmacology (2 q.h.)
Concepts and current research activity in a variety of areas, including autonomic, renal, cardiovascular, and endocrine pharmacology; chemotherapy; blood; and pharmacological aspects of immunity and allergy. *Prep. 73.815.* Alternate Years, Spring Quarter

73.822 Pathology (2 q.h.)
The student is introduced to the study of the nature of disease, emphasizing the general mechanisms and pathogenesis. Of paramount importance is the effect of disease on the human body. The language of disease is stressed. Basic principles of disease processes and more common special diseases covered extensively. A research paper may be assigned at the discretion of the instructor. *Prep. Anatomy and Physiology.*
Yearly, Spring Quarter

73.826, 73.827, 73.828 Seminar and Report in Pharmacology I, II, III (2-6 q.h.)
Reports and discussions of research and current journal literature in the field of pharmacology. *Prep. 73.814* Yearly, Spring Quarter

73.835 Neuropharmacology (2 q.h.)
Selective topics in the field of neuropharmacology will be considered to provide insight into the technical aspects of peforming neuropharmacological research. Drugs of therapeutic interest as well as drugs of abuse will be emphasized. *Prep. 73.814 Concepts of Pharmacology I*
Alternate Years, Spring Quarter

73.844 Drug Metabolism (2 q.h.)
Presentation and detoxification mechanisms relating to drug metabolism and excretion patterns; adaptive factors influencing metabolism. *Prep. 90.821.* Yearly, Winter Quarter

73.845 Radioisotopes in Biological Systems (2 q.h.)
Methodology of radioactive nuclides and application of these isotopes to biology and medicine, with special emphasis on their use in clinical analysis. *Prep. consent of instructor.* Yearly, Spring Quarter

87.801 Advanced Medical Laboratory Science — Pathogenic Microbiology (4 q.h.)
Methods of identification and differentiation of normal and pathogenic body flora. Sensitivity and the antimicrobial drugs. Students participate in some lectures given in 87.201. Assigned individual work on specialized aspects of pathogenic microbiology. *Prep. 18.220, 87.101, or equivalent.*
Yearly, Spring Quarter

87.802 Advanced Medical Laboratory Science — Hematology and Immunohematology (4 q.h.)
Morphology and physiology of blood cells and bone marrow in health and disease. Ultrastructure of the blood cells and platelets. Isoimmunization and sensitization. Students participate in some lectures given in 87.202. Assigned individual work on specialized aspects of hematology and immunohematology. *Prep. 87.101, 87.102, or equivalents.*
Yearly, Fall Quarter

87.803 Medical Immunology and Serology (2 q.h.)
Medically applied immunological and serological concepts and procedures. Students may participate in some lectures given in 87.203. Assigned individual work on specialized aspects of medical immunology and serology. *Prep. MLS General Microbiology: Basic MLS, Immunology.*
Yearly, Winter Quarter

87.804 Medical Parasitology (2 q.h.)
Laboratory identification of human parasites and a study of their life cycles. Students may participate in some lectures given in 87.204. Assigned individual work on specialized aspects of medical parasitology. *Prep. General Microbiology and permission of instructor.* Yearly, Spring Quarter

87.805 Advanced Medical Laboratory Science — Chemistry and Instrumentation (4 q.h.)
Clinical chemistry in the assessment of human physiology in health and disease. Students participate in some lectures given in 87.205. Assigned individual work on specialized aspects of clinical chemistry. *Prep. Analytical Chemistry, Organic Chemistry and Basic MLS Chemistry, or equivalent.*
Yearly, Winter Quarter

87.807 Biometrics (2 q.h.)
Statistical methods applied to biological samples and analysis of biological research data. (Note: This course is similar to 18.803 previously available through the Biology Department. *Prep. Course in laboratory math and quality control, or equivalent.* Yearly, Fall and Spring Quarters

87.810 Functions of the Human Systems (2 q.h.)
Histology and physiology of respiratory, urogenital, endocrine, nervous, and digestive systems. Lectures supplemented by current research articles and student reports. *Prep. Biology, Chemistry.* Yearly, Fall Quarter

87.811 Pathophysiology I (2 q.h.)
The nature of the disease process and the use of the laboratory in defining the disease mechanisms. *Prep. Organic Chemistry and 87.810 or equivalents.* Yearly, Winter Quarter

87.812 Pathophysiology II (2 q.h.)
The interpretation of laboratory tests in medicine. *Prep. 87.811*
Yearly, Spring Quarter

87.813 Genetic and Immunological Aspects of Blood Group Identification (2 q.h.)
This course includes lectures and laboratory experience dealing with immune response, physical chemistry of immunohematological tests, immunological diseases, tests for detection and identification of antibodies and antigens, principles of human genetics, blood group genetics, population and family studies. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep. 87.202 or 87.802 and permission of the instructor.*
Yearly, Winter Quarter

87.814 Principles and Foundations of the Blood Group Systems (4 q.h.)
This course includes lectures and laboratory experience with the human blood group systems, their antigens and antibodies, genetic inheritance and interactions, frequencies, mutants and alterations by disease states, blood group testing. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep. 87.813 and permission of the instructor.*
Yearly, Winter Quarter

87.815 The Design and Problems of Compatibility Testing (3 q.h.)
This course includes lectures and laboratory experience with design and purpose of compatibility testing, factors complicating compatibility procedure, techniques employed in compatibility testing, leukocyte, platelet and tissue compatibility, special crossmatch and transfusion procedures. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep. 87.813, 87.814 and permission of the instructor.*
Yearly, Spring Quarter.

87.816 Principles of Hematology and Coagulation Related to Transfusion (3 q.h.)
This course includes lectures and laboratory experience dealing with hemoglobins, iron metabolism, blood formation, blood volume functions of circulating cells, anemias, leukemias and lymphomes, coagulation theories, factors and disorders. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep. 87.202 or 87.802 and permission of the instructor.*
Yearly, Spring Quarter

87.817 Immunohematology Administration (4 q.h.)
This course includes lectures and laboratory experience dealing with standards for Blood Banks and Transfusion Services (Federal, State, AABB), requirements for State, FDA and NIH (BOB) licensing, the American Blood Commission, inspection and accreditation, donor procurement, interbank blood exchange, organization of Blood Bank and Transfusion Service, medical legal aspects of transfusion practice, design of physical facilities,

evaluation, selection, and maintenance of equipment, evaluation, and selection of supplies and reagents, preparation, labeling requirements, quality control systems, proficiency testing programs, record keeping, computer principles, utilization of computer facilities, operations of Donor Facilities and Blood Bank Laboratories. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep. 87.802 or 87.202 and permission of the instructor.* Yearly, Fall Quarter

87.818 Transfusion Therapy (4 q.h.)
This course includes lectures and laboratory experience dealing with selection of blood donors, phlebotomy and pheresis procedures, processing requirements, donor reactions, blood components, physical characteristics of stored blood, indications for transfusion, transfusion reaction, therapeutic phlebotomy and pheresis, autologous transfusions, pediatric transfusions, massive blood replacement, extracorporeal perfusion, cardiopulmonary bypass, dialysis. Conducted at the New England Deaconess Hospital Blood Bank Training Center. *Prep. 87.202 or 87.802 and permission of the instructor.* Yearly, Fall Quarter

87.821 Medical Laboratory Management (2 q.h.)
Management principles, including supervision, communication, laboratory staffing, personnel management, staff evaluation and education. Professional ethics, relationships, and legal responsibilities. Individual research included. *Prep. 87.811, 87.812, 87.815 and consent of instructor.*
Yearly, Winter Quarter

87.822 Medical Laboratory Management II (2 q.h.)
Laboratory operational principles, including laboratory safety, use of quality control and automated evaluation systems, laboratory economics, administration, and purchasing. Individual research included. *Prep. 87.821*
Spring Quarter

87.826 Health Science Education I (2 q.h.)
An overview of various aspects of education in the health related professions to include: Design and use of behavioral objectives, evaluation tools (both clinical and didactic), and a survey of various teaching methods. Current journal literature will supplement lecture material. *Prep. Health Professions Major.* Yearly, Fall Quarter

87.827 Health Science Education II (2 q.h.)
Various types of learning packages or self instructional aids are examined. With the aid of lecture material and independent assignment, each student will design and produce a fifteen minute auto-tutorial and will present it to the class for critique. Current journal literature will also be used. *Prep. 87.826.* Yearly, Winter Quarter

87.828 Health Science Education III (2 q.h.)
Application of learning theory to health science education in teaching didactic and psychomotor skills. Each student will be responsible for presenting one 15 minute unit to the class and an actual class to undergraduate students. Each unit will include defining objectives, selecting evaluation tools, and determining the appropriate instructional technique. *Prep. 87.827.* Yearly, Spring Quarter

87.832 Hematology I—Disorders of the Erythrocytes (2 q.h.)
The pathophysiology of red cell disorders. Clinical and laboratory correlations of the anemias and polycythemias. *Prep. Applied study in hematology.* Yearly, Fall Quarter

87.833 Immunobiology (2 q.h.)
Lectures include topics of current interest in immunobiology, such as organ transplantation, immune tolerance, enhancing and blocking factors, and the immunology of cancer. *Prep. consent of instructor.* Yearly, Spring Quarter

87.842 Hematology II—Disorders of the Leukocytes (2 q.h.)
The pathophysiology of white cell disorders. Clinical and laboratory correlations of leukemias, myeloproliferative and lymphoproliferative disorders, infections, and inherited leukocyte anomalies. *Prep. 87.202 or 87.802; and applied study in hematology.* Yearly, Winter Quarter

87.843 Immunobiology Laboratory (2 q.h.)
Students are required to undertake individual research projects relating to topics covered in lecture. *Prep. consent of instructor.*
Yearly, Spring Quarter

87.845 Epidemiology (2 q.h.)
Basic concepts of epidemiology, causes of disease, factors contributed by agents, the human host, and the environment. Acquisition and evaluation of data. Relationship of person, time, and place. Case studies and problems. *Prep. Consent of Instructor.* Yearly, Winter Quarter

87.852 Hematology III—Coagulation (2 q.h.)
Clinical and laboratory correlations of coagulation disorders. The use of factor analysis in diagnosis of coagulation disorders. *Prep. 87.202 or 87.802; 87.812 and applied study in hematology.* Yearly, Spring Quarter

87.858 Cellular Pathology (2 q.h.)
Control mechanisms, with emphasis on cancer and other cellular abnormalities. *Prep. 18.227 or consent of instructor.* Yearly, Spring Quarter

87.890 Seminar (1 q.h.)
Topics to be announced quarterly.

87.990 Graduate Research Report I (2 q.h.)
Research of a special topic in medical laboratory science involving individual research is undertaken and reported. Under the direction of a faculty member. Yearly, All Quarters

87.991 Graduate Research Report II (2-4 q.h.)
Continuation of 87.990. *Prep. 87.990.* Yearly, All Quarters

87.992 MLS Thesis (2-6 q.h.) Yearly, All Quarters

90.821 Biochemistry I (2 q.h.)
Description of the components of biochemistry, including the chemistry of carbohydrates, lipids, prostaglandins, steroid hormones, amino acids, polypeptides, proteins, purines, pyrimidines, nucleosides, and nucleic acids. Consideration of Henderson-Hasselbalch expression, buffers, and importance of pKa. *Prep. two quarters of Organic Chemistry.*
Yearly, Summer and Fall Quarters

90.822 Biochemistry II (2 q.h.)
Discussion of enzymes, enzyme kinetics, and mechanisms of enzyme reactions. An introduction to the methods used for intermediary metabolism, bioenergetics, biological oxidation-reduction reactions, and the electron transport chain. A consideration is made of carbohydrate metabolism, including the citric acid cycle, the Embden Meyerhoff pathway, and the pentose phosphate pathway. Use of isotopes in biochemistry and the role of high-energy phosphate compounds are outlined. *Prep. 90.821.*
Yearly, Winter Quarter

90.823 Biochemistry III (2 q.h.)
Lipid metabolism is presented, including the fatty acid cycle, the biosynthesis of fatty acids, and the biological formation of the prostaglandins, cholesterol, and steroid hormones. The metabolism of the various amino acids is considered, including the urea cycle, one-carbon fragments, transamination reactions, and aromatic hydroxylations. Metabolism of nucleic acids and their building blocks are discussed, as well as the genetic basis of protein synthesis, the genetic code, and the mechanisms of control. *Prep. 90.822.* Yearly, Spring Quarter

90.824 Applications of Mass Spectrometry (2 q.h.)
A comprehensive examination of the principles governing the fragmentation of organic molecules, the interpretation of mass spectra and discussion of applications of mass spectrometry to the solution of selected problems in the fields of chemistry, biochemistry and forensic sciences. *Prep. 1 year Organic Chemistry, Basic Physics, Physical Organic Chemistry desirable but not essential.* Yearly, Summer Quarter

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1976-78 school of

catalog

northeastern university
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Delivery of Services

The University assumes no liability, and hereby expressly negates the same, for failure to provide or delay in providing educational or related services or facilities or for any other failure or delay in performance arising out of or due to causes beyond the reasonable control of the University, which causes include, without limitation, power failure, fire, strikes by University employees or others, damage by the elements and acts of public authorities. The University will, however, exert reasonable efforts, when in its judgment it is appropriate to do so, to provide comparable or substantially equivalent services, facilities or performance, but its inability or failure to do so shall not subject it to liability.

Credits:
Virginia J. Mason, cover design
Matthew Ross, photographs on pages 16, 25, 28, 33, 39
Eric Prael, photographs on pages 15 and 30

Northeastern University School of Law

1976-78 Catalog

Northeastern University
School of Law
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Boston, Massachusetts 02115
Tel. (617) 437-3335

Offering Cooperative Legal Education

ETHEL AND REUBEN
GRYZMISH HALL
SCHOOL OF LAW

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Equal Opportunity Policy: Northeastern University is committed to a policy of providing equal opportunity for all. In all matters involving admissions, registration, and all official relationships with students, including evaluation of academic performance, the University insists on a policy of nondiscrimination. Northeastern University is also an equal opportunity employer; it is institutional policy that there shall not be any discrimination against any employee or applicant for employment because of race, color, religion, sex, age, national origin, or on the basis of being a handicapped but otherwise qualified individual. In addition, Northeastern takes affirmative action in the recruitment of students and employees. Inquiries concerning our equal opportunity policies may be referred to the University Affirmative Action Officer and/or the Title IX coordinator.

Academic Calendar

September 1976 – August 1978

Fall Quarter 1976

September 6	Labor Day
September 7	Registration (First-year Students)
September 8	Fall Quarter Commences
October 11	Columbus Day
November 11	Veterans' Day
November 18 – 24	Examinations (Upper class)
November 24	Fall Quarter Ends
November 25 – 26	Thanksgiving Vacation

Winter Quarter 1976 – 77

November 29	Winter Quarter Commences
December 20 – January 2	Winter Vacation
January 3	Classes Resume
January 15	Martin Luther King Day
February 21	Washington's Birthday
February 22 – 26	Examinations (Upper class)
February 26	Winter Quarter Ends
February 28 – March 4	Vacation

Spring Quarter 1977

March 7	Spring Quarter Commences
April 18	Patriot's Day
May 16 – 27	Examinations (First-year Students)
May 23 – 27	Examinations (Upper class)
May 27	Spring Quarter Ends
May 30 – June 3	Vacation

Summer Quarter 1977

June 6	Summer Quarter Commences
June 19	Commencement
July 4	Independence Day
August 15 – 19	Examinations
August 20	Summer Quarter Ends

Fall Quarter 1977

September 5	Labor Day
September 6	Registration (First-year Students)
September 7	Fall Quarter Commences
October 10	Columbus Day
November 11	Veterans' Day
November 24 – 25	Thanksgiving Vacation
November 28 – December 2	Examinations (Upper class)
December 2	Fall Quarter Ends

Winter Quarter 1977 – 78

December 5	Winter Quarter Commences
December 26 – January 3	Winter Vacation
January 4	Classes Resume
January 16	Martin Luther King Day
February 20	Washington's Birthday
February 27 – March 4	Examinations (Upper class)
March 4	Winter Quarter Ends
March 6 – 10	Vacation

Spring Quarter 1978

March 13	Spring Quarter Commences
April 17	Patriot's Day
May 15 – 27	Examinations (First-year Students)
May 22 – 27	Examinations (Upper class)
May 27	Spring Quarter Ends
May 29 – June 3	Vacation

Summer Quarter 1978

June 5	Summer Quarter Commences
June 18	Commencement
July 4	Independence Day
August 21 – 25	Examinations
August 25	Summer Quarter Ends

Faculty

Donald H. Berman, *Professor of Law;* A.B., LL.B., LL.M., Harvard University

Judith Olans Brown, *Professor of Law;* A.B., Mount Holyoke College; LL.B., Boston College

Thomas P. Campbell, Jr., *Professor of Law;* A.B., Brown University; LL.B., University of Virginia

Richard A. Daynard, *Professor of Law;* A.B., M.A., Columbia University; LL.B., Harvard University

Charles L. Field, *Assistant Librarian and Assistant Professor of Law;* A.B., Harvard University; M.S., Simmons College; J.D., Suffolk University

John G. S. Flym, *Associate Professor of Law;* B.S., Columbia University; LL.B., Harvard University

Daniel J. Givelber, *Professor of Law;* A.B., LL.B., Harvard University

Robert W. Hallgring, *Professor of Law;* A.B., Princeton University; LL.B., Harvard University

John C. O'Byrne, *Dean and Professor of Law;* A.B., M.S., Syracuse University; LL.B., (J.D.), Harvard University

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Lecturers-in-Law

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Hon. Frederick L. Brown, A.B., LL.B., Harvard University; Associate Justice, Appeals Court, Commonwealth of Massachusetts

David R. Herwitz, B.S., Massachusetts Institute of Technology; LL.B., Harvard University; Professor of Law, Harvard Law School

Dr. Robert G. Mayer, A.B., Cornell University; M.D., Jefferson Medical College; Staff Psychiatrist, Boston Veterans Administration Hospital

William M. Prifti, B.S., J.D., Northeastern University; Private Practice

Albert P. Zabin, B.A., Brandeis University; LL.B., Harvard University; Private Practice

Norman S. Zalkind, B.S., Boston College; LL.B., Boston University; Private Practice

Administrative Staff

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Barbara L. Iredell, *Executive Assistant*

Marianne F. Radziewicz, *Director of Admissions*

Shirley J. Ramsey, *Administrative Secretary to the Dean*

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Library Staff

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Purpose

The purpose of the Northeastern University School of Law is to train lawyers to meet the challenges and obligations cast upon the legal profession by contemporary society. The School was founded on the conviction that traditional legal education inadequately attains this goal and that a law school program must match the pace of change in the world and national scene.

The most frequently remarked shortcoming of traditional law school training is the neglect of the practical side of a lawyer's work. The consequence is that newly graduated students are poorly equipped to pursue their profession until they have served a period of apprenticeship. In this respect, they suffer in comparison with their contemporaries who enter other professions.

The School of Law has adopted the Cooperative Plan of Education to ensure that each student acquires a significant amount of legal experience before receiving a law degree. The Cooperative Plan has been used extensively in other fields of learning, and its adaptation to legal education adds realism and excitement to what has been an excessively academic preparation for the bar.

The curriculum of the School is designed to provide a solid and relevant legal training for service throughout the country in large and small private law firms, corporations, public legal agencies, and government agencies. The law as it is, and as it should be, is the concern of all lawyers wherever they may serve.

The cooperative educational program enriches classroom study by exposing students to reality. Of all the professional disciplines, none demands a strong sense of reality more urgently than does law. Using the actual practice of law as its laboratory, the School adds depth to the curriculum by balancing academic instruction with current experience in the varied aspects of lawyers' worlds. Thus, the understanding of legal theory is enhanced by the understanding of the law in action.

History

Northeastern University began a long tradition of legal education in 1898, and for nearly 60 years the School of Law produced lawyers who achieved distinction at the bar and on the bench.

Originally, emphasis was placed on evening education to provide educational opportunities for persons who would not otherwise have a chance to develop their talents. By 1953, shifting social and economic patterns made the evening school a doubtful vehicle for entry into a profession whose practice required the mastery of a rapidly expanding body of knowledge and skills. Lacking an alternative plan consistent with the purposes of the University, the Trustees closed the School in 1953.

In the mid-sixties, loyal graduates of the School of Law urged the University to re-establish the School. The President and Trustees of the University undertook a careful and extensive examination of the nature of legal education in the United States, and the result was the decision to revive the School of Law as the nation's only cooperative law school.

The re-established School of Law was opened to students in September 1968. Faculty strength, library holdings, and research facilities were carefully developed to support the new concept of cooperative legal education. After inspection by the American Bar Association, the School was accredited in 1969 and was admitted to membership in The Association of American Law Schools in 1970.

Cooperative Legal Education

Cooperative legal education provides alternating intervals of full-time professional work experience and full-time academic education. A legal education which combines academic study and practical experience is the best possible preparation for a legal career. Law students spend the first academic year in full-time study. After successful completion of the first year, the class is divided in half and the remaining two years are spent in alternating three-month quarters of full-time academic work and full-time employment as paid law clerks. Successful completion of seven academic quarters and four work quarters is required for the degree of Juris Doctor.

The Cooperative Plan has an especial importance to students who want to practice law. It has been traditional in the legal profession to view the relative helplessness of newly admitted attorneys with a mixture of humor and despair. The graduates of Northeastern School of Law are in a different position. They have 12 months of practical experience before graduation. Cooperative work quarters will not produce a finished lawyer, but the combination of academic and work quarters provides a substantial advance in merging academic learning with skills and abilities.

One of the important collateral benefits of the Cooperative Plan, especially appreciated by students, is the opportunity to explore

four different employment situations and four geographic areas of the country before making a final career commitment. Law firms, government agencies, corporate legal offices, legal service and public interest organizations, and defender/prosecution programs are major employers. Students have worked in 38 states and four foreign countries during their cooperative quarters. "Co-op" opportunities are nation-wide. The Boston area cannot support all cooperative students; therefore, a Northeastern applicant must be prepared to explore opportunities in other parts of the country. In recent years, approximately one-half of the cooperative jobs have been outside the Boston metropolitan area. Applicants must consider long-term commitments (leases, family arrangements, etc.) with the cooperative program in mind. Mobility and flexibility make the cooperative experience rewarding and exciting.

In obtaining cooperative employment, students enter into a professional relationship in which the hiring decisions are made by agreement between the student and employer. The School strives to be certain that students are fairly compensated according to the students' experience and the employers' resources. However, applicants should clearly understand that the cooperative program is educational and not a form of financial aid. Some very interesting and important jobs provide little, if any, compensation. While the School does provide an open, fair, and supportive system of information about jobs, it cannot guarantee a position for every student. Indeed, no such undertaking is either possible or appropriate with respect to professional employment. The School does not deal with employers that discriminate on the basis of race, sex, age, religion or ethnic origin.

The Cooperative Plan undergoes constant evaluation. Employers evaluate a student's performance, the student evaluates the cooperative job, and the faculty and staff regularly re-appraise the educational value of each cooperative position.

Facilities

The School of Law is located in the Ethel and Reuben Gryzmish Hall, opened in 1970 and named in honor of a distinguished alumnus and his wife. The building houses tiered classrooms for

basic instruction, seminar rooms, a lounge, faculty offices, and a spacious and realistic courtroom.

The Law School building is located on Northeastern University's main campus. The full array of University facilities are nearby, including the main library, student center, bookstore, theater, gymnasium, and swimming pool.

Library

The Berkowitz Law Library is an integral part of the School of Law and is located on the second level of Gryzmish Hall. The Library is air conditioned, with a spacious reading room decorated in contemporary style. In the stacks there are carrels and conference/typing rooms available for individual student use.

The rapidly growing Law Library has a carefully selected collection of more than 85,000 volumes. It includes all the official reports of every state court of last resort, the National Reporter System, annotated and topical reports, selected materials of administrative bodies, numerous loose-leaf reporter services, a complete collection of the current state and Federal annotated codes, and a strong collection of English and Canadian decisions and legislation. There is also a comprehensive collection of current legal journals and reviews, as well as treatises and textbooks.

Of special interest is the Sara R. Ehrmann Collection on Capital Punishment. Named in honor of its donor, a pioneer in the movement to abolish capital punishment, this collection of books, articles, legislation, and news items presents a full picture of the operation of the death penalty in this country from 1920 to the present.

The private library of Professor Quincy Wright, the noted scholar, forms the nucleus of an impressive international law collection.

Law students also have access to the Northeastern University libraries and, by special arrangements through the office of the Law Librarian, to various law school and research libraries in the metropolitan Boston area.

General Information

The School of Law and the University are located near Boston's Fenway and Back Bay section, a center of education and culture. Students at the University have readily available a range and quality of music, art, and lectures unexcelled in America. Within easy walking distance of the School of Law are the Boston Museum of Fine Arts, Symphony Hall, Simmons College, the Isabella Stewart Gardner Museum, Emmanuel College, Horticultural Hall, the New England Conservatory of Music, and the Prudential Center.

In Boston, a law student can observe the Supreme Judicial Court of Massachusetts, the United States Court of Appeals for the First Circuit, the Federal District Court, the Massachusetts Appeals Court, the Massachusetts Superior Court, and a full range of lower tribunals. The metropolitan Boston area presents an array of municipal and county agencies, and the state legislative process can be studied in action at the Massachusetts State House on Beacon Hill.

Housing

Because the School of Law is located in an area heavily populated with students from several educational institutions, there is a shortage of available housing. However, the University Housing Office lists available private rental accommodations for students. (University dormitories are restricted to undergraduates.)

Requests for housing information or accommodations should be made in writing to the Director of University Housing, Northeastern University, 360 Huntington Avenue, Boston, Massachusetts 02115. The Housing Office is located at 122 St. Stephen Street.

University Health Service

The University Health Service is located in the Forsyth Building, near the School of Law. Regular clinic hours for students are maintained by the University Physician and his staff.

All full-time students are covered by a Blue Cross-Blue Shield policy from the day of registration until 12:00 noon on the day following withdrawal, leave of absence, dismissal, or graduation from

the University. Each student receives a brochure describing the policy.

Prior to initial registration in the University, each student must file with the Health Service physical examination and chest x-ray records. Forms for the examination are available at the Health Service Office, and are mailed in advance to prospective students who indicate their intention to register in September. The University Health Service cannot provide medical services for students who do not comply with this requirement.

Student Participation

The School of Law encourages student participation in the development of the program of instruction. An educational experience can be enriched beyond the value of its substantive content by having the student reflect upon the educational process. Students, individually and collectively, are invited to join with the faculty in the continuing evaluation of the educational process.

Black American Law Students Association

Northeastern has a chapter of the Black American Law Students Association. Through BALSA, Black and Puerto Rican students work closely with the School of Law in an effort to recruit minority students.

BALSA's commitment to incoming minority students continues throughout the year. Activities include a fall orientation program and an educational assistance program designed to supplement course material.

BALSA has published a brochure designed to inform potential applicants about some of the opportunities available at Northeastern University and the School of Law.

For further information contact BALSA at the School of Law.

National Lawyers' Guild

The Northeastern Chapter of the National Lawyers' Guild is an active student organization. Activities include participation in first-year orientation, job retreats, political projects of local, regional and national scope, and periodic chapter business meetings.

Placement Office

The placement office operates under the supervision of the Assistant Dean and assists both students and graduates in securing professional employment. In the last three years, 80% of the graduates have secured employment by the time they were admitted to the bar. The average starting salary of these classes was $13,500. A substantial number of graduates secure permanent positions through the cooperative experience. An average of 10 percent of each graduating class has accepted judicial clerkships, including one student who was the first woman clerk for the Chief Justice of the United States. The placement staff gathers information, helps arrange interviews, and maintains job listings. The School of Law is committed to helping its students secure and maintain fulfilling professional careers.

Admission

A candidate for admission to the School of Law must hold a bachelor's degree from an accredited college or university. Acceptance is based upon superior academic achievement in undergraduate studies and acceptable scores on the Law School Admissions Test, administered by the Educational Testing Service of Princeton, New Jersey. The test is administered periodically at convenient centers throughout the country. Applications for the LSAT and for admission to the School will be sent upon request.

The School of Law is committed to the highest academic standards. No candidate will be accepted whose credentials promise anything less than superior performance. The School undertakes to seek cooperative work opportunities at a professional level in private, public, and corporate offices, and to fill these positions with students who can perform productive legal services as early as the end of the first year of law school. Thus, the School seeks students of superior ability, strong motivation and maturity.

The Northeastern School of Law solicits the interest of prospective law students whose qualifications make them eligible for admission to highly selective law schools. The distinctive program of the School appeals to persons who are interested in a program of professional instruction heavily reinforced by experience in legal practice. The goal of the School is to produce lawyers who can excel in the traditional skills of the law and who can give learned, professional responses to the problems, both traditional and novel, which are making increasing demands upon the legal system.

No specific fields of undergraduate study are demanded as a pre-law background. Of particular importance are the mastery of oral and written verbal skills, a capacity for independent research, and the ability to exercise critical judgment. A basic knowledge of accounting and business is useful in some parts of the law curriculum. Undergraduates are best advised to pursue a wide range of interests.

In gauging one's chances of being admitted to the School of Law, the following information on admissions policy and practice may be helpful. The median LSAT score of all classes has been well in excess of 600. Students with high scores but inferior college grades are rarely accepted. In recent years, both the application pool and entering class have been almost equally male and female. No specific grade-point average is required, but accepted applicants are generally

in the top quarter of their classes. Great weight is placed upon intellectual ability and the nonacademic qualities of the candidate, indicated by such factors as extracurricular interests and activities, skill in written expression, work experience, and career goals.

The School of Law requires that all applicants register with the Law School Data Assembly Service for the submitting of their complete academic records and the reporting of the LSAT scores.

Applicants who have outstanding records of nonacademic achievement should not be deterred because their college grades and LSAT scores are not distinguished. The student body of the School of Law includes many men and women who have had very successful careers between college and law school. The School seeks students who are capable of superior achievement and considers the full range of an applicant's aptitude, background, and accomplishments.

Applications for entrance in September 1977 must be submitted to the School of Law no later than February 15, 1977. Candidates are advised that the filing deadline is subject to change in 1978.

The School of Law follows a "rolling admissions" policy. The Admissions Committee reviews applications as the files are completed. If the certainty of acceptance is not clear, an applicant's name is held on a waiting list if he or she so desires.

Students who receive notice of acceptance must pay a nonrefundable tuition deposit within the time period stated in the letter of acceptance.

If an applicant decides not to attend the School of Law after paying the final deposit, notice should be given to the Director of Admissions so that the vacant space in the class may be filled by someone on the waiting list.

Transfer

The School also considers applications from students who have completed a year at another law school and wish to apply with advanced standing. The number of seats available for transfer students is limited. Requests for application with advanced standing should be sent to the Director of Admissions, Northeastern University School of Law.

Distribution of Students by Undergraduate Schools as of September 1975

American University	2
Amherst College	1
Antioch College	5
Barnard College	3
Bennington College	1
Boston College	6
Boston University	6
Bowdoin College	3
Bradley University	1
Brandeis University	12
Brown University	11
Bucknell University	1
Bryn Mawr College	1
Calvin College	1
Carnegie-Mellon University	1
Case Western University	1
Catholic University	2
City College of New York	1
Clark University	3
Cleveland State University	1
Colby College	2
Colgate University	1
College of Wooster	1
Columbia University	1
Connecticut College	7
Cornell University	6
Dartmouth College	3
Denison University	1
Dickinson College	2
Duke University	1
Eastern Michigan University	1
Emmanuel College	1
Evergreen State College	1
Fordham University	1
Framingham State College	1
George Washington University	3
Goddard College	3
Goucher College	2
Grinnell College	1
Hampton Institute	1
Hampshire College	1
Harvard University	14
Haverford College	2
Herbert Lehman College	1
Holy Cross College	2
Hunter College	2
Indiana University	
at Bloomington	1
at Fort Wayne	1
Jackson College	6
Johns Hopkins University	4
Kenyon University	1
Lake Forest College	2
Lowell State College	1
Macalester College	2
Manhattanville College	1
Massachusetts Institute of Technology	3
Michigan State University	1
Middlebury College	4
Montclair College	1
Mount Holyoke College	2
Muhlenberg College	1
Newton College	3
New York University	3
New School of Social Research	1
Northeastern University	15
Northwestern University	3
Oakland University	1
Oberlin College	8
Ohio State University	4
Pennsylvania State University	2
Princeton University	3
Queens College	2
Radcliffe College	3
Rensselaer Institute of Technology	1
Rutgers University	2
St. Bonaventure University	1
St. Johns College	1
St. Johns University	1
St. Mary of the Woods College	1
Shimer College	1
Simmons College	3
Simon Fraser University	1
Smith College	7
Stanford University	3
State University College	1
State University of New York	
at Albany	2
at Buffalo	5
at Stonybrook	6
Stonehill College	1
Swarthmore College	2
Syracuse University	4
Temple University	1
Trinity College	2
Tufts University	8
Union College at Schenectady	1
University of California	
at Berkeley	8
at Los Angeles	1
at Santa Barbara	2

at Santa Cruz	2
University of Chicago	3
University of Colorado	2
University of Connecticut	1
University of Georgia	2
University of Hartford	2
University of Illinois	4
University of Iowa	1
University of Kansas	1
University of Maine	1
University of Maryland	3
University of Massachusetts	
at Amherst	7
at Boston	6
University of Michigan	16
University of Minnesota	1
University of Missouri	1
University of New Hampshire	1
University of North Carolina	1
University of Pennsylvania	8
University of Pittsburgh	3
University of Rhode Island	1
University of Rochester	3
University of Southern Florida	2
University of Southwestern Louisiana	1
University of Texas	1
University of Vermont	1
University of Washington	1
University of Wisconsin (Madison)	13
Upsala College	3
Vassar College	4
Washington University	1
Wellesley College	9
Wesleyan University	2
Wheaton College (Illinois)	1
Wheaton College (Massachusetts)	1
Williams College	1
Worcester Polytechnic Institute	1
Yale University	3

Financial Information

Tuition and Fees

Tuition for the academic year 1976-77 is $3,300 for the first year and $2,700 for the upper-class years. An annual fee for supplementary printed and duplicated materials is also charged to each student. The University tries to keep tuition and fees as low as possible, but it must reserve the right to revise tuition rates and fees by action of the Board of Trustees at any time.

The tuition deposit required of students who are accepted for admission is applied against the first quarter tuition bill. The deposit is nonrefundable. Students who withdraw from the University during an academic quarter receive a refund of a portion of the tuition. During the first week of the quarter the entire tuition, less the deposit, is refunded; thereafter, the refund is reduced 25 percent each week. After the fourth week of the quarter, no refund is made.

Books assigned by the faculty in the various courses are available through the University Bookstore. It is estimated that the annual book expense for the first-year student will be approximately $200. In some instances, used books may be obtained at a substantial saving.

Financial Aid

Northeastern University has a limited amount of financial aid available to assist students whose resources would otherwise make it impossible to attend the School of Law. The larger portion of these funds is awarded to the first-year students, with lesser amounts going to second- and third-year students. A few positions as research assistants to members of the faculty are available to second- and third-year students on the basis of ability and financial need.

The University awards all financial aid on the basis of financial need. It is a participant in the Graduate and Professional School Financial Aid Service. All applicants for aid must file a GAPSFAS form. The GAPSFAS application may be obtained from the financial aid officer at the institution in which the student is currently enrolled or from the Office of Financial Aid at Northeastern University. The GAPSFAS form may also be obtained from the Graduate and Professional Financial Aid Service, Box 2614, Princeton, New Jersey 08540.

Grants and Scholarships

Northeastern University provides a limited number of grants and scholarships to students who demonstrate a financial need. Part of these funds come from the following named scholarships.

The Thomas E. Cargill, Jr., Scholarship

The Thomas E. Cargill, Jr., Scholarship, established in 1972 by Thomas E. Cargill, Jr., is awarded to a student in the School of Law. Mr. Cargill is a graduate of the School of Law, Class of 1948, and is a Director of The National Council of Northeastern University. Preference will be given to students based upon demonstrable financial need.

The Eli Jacobson Memorial Scholarship

This fund was established in 1975 in memory of Mr. Eli Jacobson by his many friends and relatives. Mr. Jacobson was an alumnus of the School of Law, Class of 1933. He was a member of the Northeastern University Corporation and Board of Trustees. During his lifetime, Mr. Jacobson gave his support to many philanthropic organizations including Northeastern University and it is most fitting that the spirit of his generosity will continue through this scholarship fund.

Income from this scholarship fund will be awarded annually to students in the School of Law who demonstrate financial need, soundness of character, and academic ability.

The Northeastern University School of Law Alumni Association Scholarship

To commemorate the founding of the School of Law in 1898, the School of Law Alumni Association established this award in 1974. This scholarship is to be awarded annually to a second-year law student who demonstrates superior potential and financial need.

The Irving Perlmutter Scholarship

The Irving Perlmutter Scholarship, established in 1972 by Irving Perlmutter, a graduate of the School of Law, Class of 1938, is awarded annually to a student or students in the School of Law. Preference is given to students who demonstrate financial need.

John T. Powell Memorial Scholarship

The John T. Powell Memorial Scholarship was established in 1974 by the law firm of Hale and Dorr, in memory of Mr. Powell, a partner in that firm and a graduate of the School of Law, Class of 1928. The income from this scholarship fund is awarded annually to one or more deserving students enrolled in the School of Law who demonstrate financial need, academic ability, and soundness of character.

The Ralph B. Rogers Scholarship

This scholarship has been established through the generosity of Ralph B. Rogers, a graduate of the School of Law, Class of 1939. The scholarship is awarded either to entering students or to upper-class students enrolled in the School of Law.

Loans

Guaranteed Insured Loan Programs

These loans are available through lending institutions in the applicant's home area. Under this program a student may borrow as much as $2,500 per academic year to a maximum indebtedness of $10,000. Repayment of principal and interest need not begin until nine months after the termination of studies.

Because of the easy availability of these funds relative to other kinds of financial assistance, it is recommended that all aid applicants first seek assistance from this source.

National Direct Student Loan

The amount of a loan is determined by the financial position of the student and his family and by the availability of these funds at Northeastern University. The total amount of indebtedness, however, may not exceed $10,000. Repayment of these loans begins nine months after the termination of study.

College Work-Study Program

Not to be confused with Northeastern University's Cooperative Education Program, this is basically a federally supported part-time employment program. Jobs are available on the campus or in nonprofit agencies in the greater Boston area. Determination of eligibility for work-study employment and actual job placement are accomplished through the Office of Financial Aid.

Other Assistance

There are some openings each year as residence director or resident assistant in the undergraduate male dormitories. Inquiries and details concerning availability of these jobs may be obtained from the Associate Dean of Students for Housing, 203 Ell Student Center.

Occasionally, spouses of male law students are able to obtain positions as full-time residence directors in the women's dormitories at Northeastern University. These positions provide a salary plus full-time maintenance, which includes a comfortable apartment and meals. Inquiries may be made to the Associate Dean of Students, Room 104, Ell Student Center.

Degree Program

Degree

Upon recommendation of the faculty, the degree of Juris Doctor (J.D.) will be conferred on a student who successfully completes seven quarters of law study and four quarters of cooperative work. All first-year courses are required; Professional Responsibility is the only required upper-level course.

Grading System

The Cooperative Plan of legal education diminishes the utility of traditional grading. Academic courses are graded on a pass-fail basis. The teacher of each course makes a written appraisal of each student's performance in the course. Further, each cooperative employer submits a written evaluation of the student's professional performance. These academic and professional evaluations are made part of the student's permanent record.

Prospective employers of Northeastern graduates rely on the evaluations of a student's professional performance made by the lawyers who closely supervised the student over the four quarters of practical experience, as well as on the academic appraisal.

It should be clearly understood that the pass-fail grading system does not eliminate the academic risk to which a law student is exposed. The faculty reserves the right to dismiss any student whose individual written work, classroom performance, examinations, and employer evaluations indicate unsatisfactory progress toward professional competence.

Attendance and Conduct

Regular class attendance is expected. The right to take examinations and to continue as a student in the School of Law is conditioned upon regular attendance.

Students are subject to the rules of the University and the School of Law, and their continuance at the School is conditioned on the observance of these rules. Students participate in the process of developing the policies of the School as prospective members of a responsible and self-disciplining profession.

Academic rules are published in the *Student Handbook*.

Admission to the Bar

Many states require that a student who plans to apply for admission to the bar file an official state registration prior to the commencement of legal studies. The requirements of a particular state can be obtained from the Board of Bar Examiners. Each student should investigate the requirements of the state in which he or she plans to practice.

Curriculum

First-Year Required Courses
(No cooperative work)

Civil Procedure/Torts

This is a course which attempts, in the first year, to begin integrating issues of process and substance. Issues normally found in a traditional civil procedure course are covered, such as pleadings, jurisdiction, allocation between judge and jury, discovery, motions, directed verdict, summary judgment, trial and res judicata. Intentional torts, negligence and causation are explored in depth; other torts are covered in an upper class course. Exercises which force the application of tort principles into a procedural context are interspersed with classes centered on case analysis.

Constitutional Law

Constitutional law focuses on the process with which the Supreme Court resolves difficult constitutional questions. The initial focus is on questions involving the nature and scope of judicial review. Then, the source of governmental powers and matters of Federalism are considered through an extensive study of the commerce clause. The second half of the course deals with various methods where the Constitution protects the individual from governmental overreaching. This section includes an inquiry into procedural and substantive due process, equal protection, and the First Amendment. Recent unedited Supreme Court decisions supplement traditional casebook materials.

Contracts

The course considers the purpose and scope of the legal protection given to contracts. The legal principles of contract formation, enforcement and remedies are examined, as well as the underlying policies of private autonomy and social control through legislation and judicial decision. Detailed consideration is given to the sales of goods under Article 2 of the Uniform Commercial Code. The historical and economic aspects of the subject are also explored.

Criminal Law and Procedure

The course explores the basic principles of criminal law in a procedural context. It begins with an overview of procedure: grand jury and preliminary hearings, bail, right to counsel, professional ethics, jury trial, other 5th and 6th Amendment rights, sentencing and plea bargaining. The course then explores some of the major themes of substantive law: act, capacity, intent, homicide, mental illness, attempt, conspiracy, justification and excuse. It concludes with the consideration of specific crimes: rape, kidnapping, burglary and theft. The objective of the course is to develop a practical view of the criminal process.

Federal Income Taxation

The purpose of this course is to teach first-year students to interpret an elaborate and complicated statute. In addition to exploring tax problems that confront individuals, businesses, and other groups, the course examines the need for substantive tax reform and the potential use of the tax mechanism to effect social change.

Legal Writing and Moot Court

The ability to draft legal documents, to express agreements in clear and unequivocal language, to summarize research findings in legal memoranda, to prepare persuasive briefs in support of a position, and to develop other written instruments are essential parts of a lawyer's skills. The legal writing emphasis continues into the moot court program. Each first-year student must participate in the preparation of a brief and the presentation of an oral argument in an appellate case.

Property

The course begins with an introduction to the law of personal property. The focus then turns to various interests in land, with heavy emphasis placed on landlord-tenant relationships. Mortgages, real estate financing, and development of land resources are considered next. Both private restrictions on land use and community planning techniques are studied.

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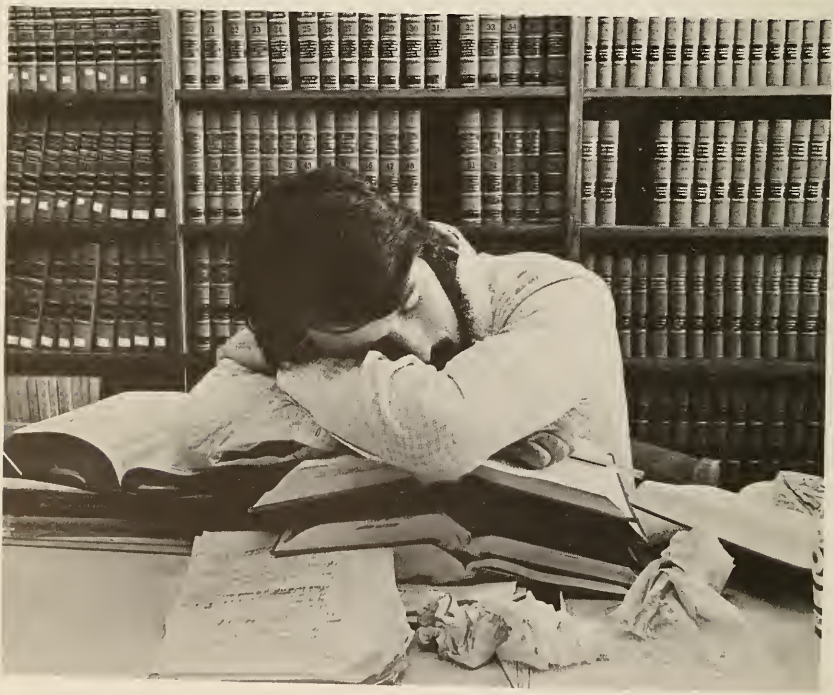
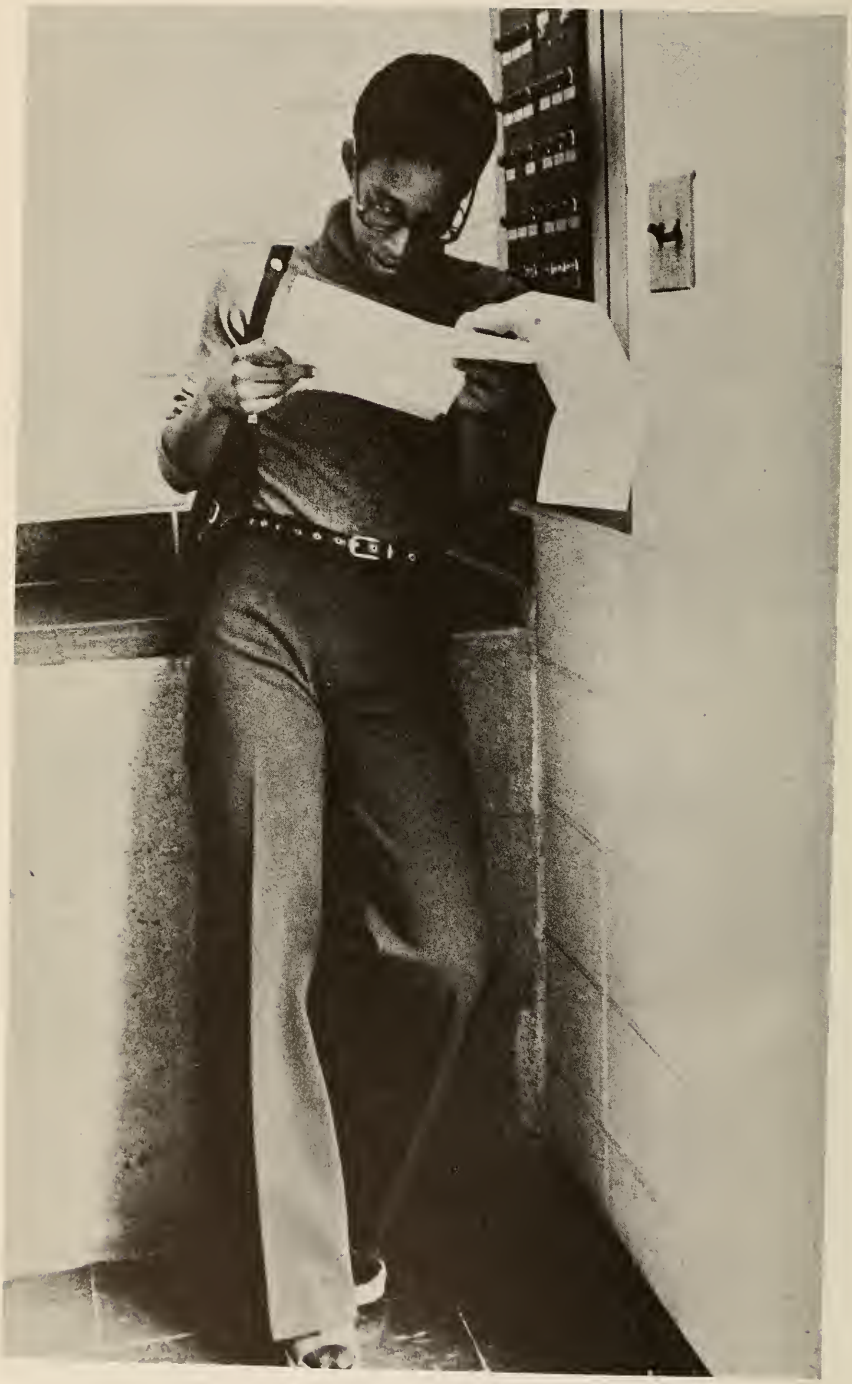


UPPER-LEVEL COURSES

Administrative Law
American Legal History
Antitrust
Business Planning
Civil Advocacy
Civil Trial Practice
Commercial Paper
Conflicts of Law
Constitutional Law and Minority Issues
Consumer Protection Planning
Corporations
Criminal Advocacy
Criminal Trial Practice
English Legal History
Environmental Law
Equal Protection of the Law
Equitable Remedies
Estate Planning
Evidence
Family Law
Federal Jurisdiction
Income Taxation of Trusts and Estates
International Law
Involuntary Commitment of the "Mentally Ill"
Labor Unions
Labor Relations Law
Law, Language and Ethics
Legal Accounting
Legal Process
Prisoners' Rights
Products Liability, Dignitary and Commercial Torts
Professional Responsibility
Real Estate Transactions
Secured Transactions
Securities Regulation
Taxation of Corporations and Shareholders
Trusts and Estates I, II
Welfare Law
Women's Rights

Professional Responsibility is the only required upper-level course.

A few courses may be offered in alternate years. Some courses will not be taught if the enrollment is not sufficient. The listing of courses is not a fixed or guaranteed curriculum.



Upper-level Courses

Administrative Law

The ways in which lawyers can use the judicial process to control official behavior which affects private interests. The course considers both the procedures which government officials must follow in reaching their decisions, and the methods and limitations upon judicial review. The course is conducted entirely through discussion of questions and problems which are distributed at the beginning of the course.

American Legal History

An introduction to the history of American law, beginning with an examination of the role of the common law in America and a review of the difficulties with the reception of English law after independence; turning to consideration of the problems of development of a native American law in a federal system; and concluding with a study of the 19th-century movement for codification.

Antitrust

The legal and institutional bases of present-day efforts at governmental control of private economic power and the administrative implementation of these controls. Specific attention is given to monopolization, extensive concentration in industry, and combinations to restrain trade through horizontal and vertical arrangements.

Business Planning

An examination of the basic legal materials and rules through which business enterprises, particularly corporations, are organized, funded, and operated. The purpose is to provide familiarity not only with the legal materials, but also with the techniques used by lawyers in applying them. Problems of structure, raising capital, compensation, capital changes, liabilities of promoters, directors and officers, and the taxation of businesses and shareholders are considered. The method is an analysis of a series of problems and the application of legal materials to work out solutions. Prerequisites: Corporations and Federal Income Taxation.

Civil Advocacy

The course revolves around one very complex real multi-party factual situation. A litigation is simulated from client interview through trial. The students divide into law firms representing each party. Instructional techniques include the analysis of student performances, with line-by-line critiques of written work and classroom review of videotaped oral presentations. The course ends with a lengthy jury trial.

The major purposes of the course are:

1. To give intensive, guided experience and training in all elements of civil litigation, including interviewing, investigation, pleading, written and oral discovery, motions, negotiations, pretrial conference, legal writing (including different types of briefs), and the trial itself.

2. To teach written and oral advocacy techniques and skills, with emphasis on discerning and achieving goals, discovering and using facts, clear expression, persuasion, and balanced judgment.

3. To teach the rules of evidence as a working discipline.

Civil Trial Practice

An introduction to the tactical and strategic problems commonly encountered in trial cases. While the class orientation is civil litigation, the techniques and problems also are common to criminal cases. Attention is also given to the forensic aspects of trial practice; students are taught the basics of direct and cross examination, and the techniques and fundamentals of opening and closing summations. Class enrollment is limited; students are required to have had, or be taking, Evidence.

Commercial Paper

A study of the law of negotiable instruments and bank deposits and collections through an examination of Articles 3 and 4 of the Uniform Commercial Code, relevant cases, problems, and general issues of statutory construction.

Conflicts of Law

The student is introduced to difficult problems that arise when some or all of the operative facts of action involve more than one jurisdiction. The course emphasizes the modern choice of law methodology and the expansion of a state's capacity to exercise jurisdiction over non-resident defendants.

Constitutional Law and Minority Issues

The rapidly growing body of law attacking racial discrimination and the elimination of racist policies in education, employment, public accommodations, and the administration of justice. The historical background of these fields is reviewed, but focus is on contemporary issues, including: the "*de facto-de jure*" school controversy, the legal support for "community control" concepts, the limits of affirmative action in employment litigation, and the

conflict between the goals and activities of "black caucuses" and collective bargaining agreements. Special attention is given to limits on the right to protest all forms of discrimination imposed by the courts. The alternatives to legally protected protest activities, including civil disobedience, are also reviewed.

Consumer Protection Planning

The course analyzes and compares common law and regulatory approaches to protecting consumer interests. Special emphasis is on planning, evaluating, and improving legal institutions which affect consumers. Substantive areas of concern include deception and overreaching, unsafe products, and governmentally sanctioned restraints upon competition. Procedural hurdles involved in obtaining effective relief for consumer complaints are also examined.

Corporations

Use of modern business corporations, both public and closely held; comparison with other forms of business associations; formation of the corporation; control and management of the corporation; allocation of power among and action by directors, officers, and shareholders; duties of directors and controlling shareholders; regulation of the exercise of corporate powers by the fiduciary principle and by Federal and state securities regulations; and the enforcement of corporate duties and protection of shareholders' rights, through derivative suits and other actions. In addition, the development of a federal corporation law under the aegis of the SEC will be considered.

Criminal Advocacy

Techniques, strategies, and decisions involved in the preparation and trial of a criminal case, with constant emphasis on translating theory into the mechanics of practice. The course attempts to provide students with an analytical framework to enhance self-learning on the basis of practical experience. Students perform simulated exercises based on hypothetical facts such as direct and cross examination, interviewing, argument, and other advocacy skills. All exercises are videotaped and analyzed to formulate criteria for self-evaluation. Students are expected to devote sufficient time to develop a working knowledge of evidence and criminal procedure. Each student participates in the preparation and trial of one actual case in a local criminal court. The final classroom exercise is a mock trial. Class enrollment is limited.

Criminal Trial Practice

The course begins with lectures on criminal cases tried in both state and federal courts, from arrest to appeal. One case is then used throughout the course in which students are assigned roles including defense attorney, prosecutor, judge, witness (both expert and lay), juror, clerk, and defendant. All materials are based on actual cases. The main emphasis is on federal criminal trials.

English Legal History

An examination of the development of important institutions of the law from Anglo-Saxon times to the Tudor period. Students trace the growth of the judiciary, the jury, legislation, and the legal profession and its literature, together with important substantive areas of the law, such as property, procedure, and tort. Source materials are used throughout and supplemented by readings in the standard literature of legal history.

Environmental Law

An examination of the legal institutions and doctrines relevant to the control of the environment. The course deals with water

and air pollution and its control by private parties, municipalities, states, and the Federal government, as well as problems of resource allocation.

Equal Protection of the Law

A study of the case law interpreting the Equal Protection clause of the 14th Amendment of the United States Constitution, including: the difference between state and private action, the effect of the equal protection clause on racial and sexual classifications, voting rights, and public finance, and of statutes enacted to enforce the Equal Protection clause. The emphasis throughout the course is upon rigor in constitutional and statutory interpretation and upon the proper role of the judiciary in political decisions.

Equitable Remedies

Equitable and extraordinary remedies, with particular emphasis on the contempt process and other problems relative to enforcing specific decrees. The course also attempts to impart a sense of the substantive intuition underlying equity jurisprudence.

Estate Planning

Taxation of gratuitous transfers of property at death and during life, Federal estate and gift taxes, state death or succession taxes, and the principles of estate planning.

Evidence

Exploration of the rules of evidence and their rationale, including relevancy, hearsay, impeachment and cross-examination, opinions and experts, documents and nonconstitutional privileges. Several classes center on student use of the rules in simulated problems.

Family Law

Primary focus is on the process of the dissolution of marriage. In addition to studying the law of divorce, alimony, child support, custody, and the tax aspects of divorce, the course focuses on certain skills of the lawyer which are necessary to represent clients adequately. This includes: client interviewing and advice, working with mental health professionals, preparing and examining expert witnesses, negotiating, and drafting complex agreements.

Federal Jurisdiction

A study of the role of the Federal courts in the operation of the Federal system. The course focuses on the jurisdiction and functioning of the Federal courts, the distribution of authority between Federal and state courts, and the roles of Federal and state law in the Federal system. Topics include: the constitutional limits of Federal judicial power; appellate and collateral review in the Federal courts,

diversity, Federal question jurisdiction of the Federal courts; and choice of law in Federal courts. This course requires a good working knowledge of constitutional and administrative law.

Income Taxation of Trusts and Estates

This course is open only to those also studying trusts. The subject matter is the income (not estate and gift) taxation of the family, the proper taxation of married and single persons, and the use of schemes (especially trusts) to deflect the taxation of income to members of the family in low tax brackets.

International Law

The law of nations, including the nature and sources of international law; jurisdiction of states over persons and territory; recognition of states and governments; governmental immunities; the law of treaties; legal restrictions on the use of force; and principles of state responsibility. International organizations, including the United Nations, are also studied.

Involuntary Commitment of the "Mentally Ill"

Taught jointly with Tufts New England Medical School psychiatric residency program, this seminar (restricted to a total of 30 law students and doctors) examines the various processes, procedures and standards by which people are involuntarily deprived of their liberty on grounds of "mental illness." Half of the sessions will be held at Boston Veterans Administration Hospital, at which issues presented by individual patients will be considered in light of legal principles.

Labor Unions

A study of relationships between individuals and labor organizations; the rights, obligations and benefits of union membership; and the governance and supervision of labor organizations by federal law. Particular emphasis is placed upon the Labor-Management Reporting and Disclosure Act of 1959.

Labor Relations Law

A general introduction to the law of labor relations through an examination of the National Labor Relations Act and leading cases, together with historical, social, and economic materials. Topics covered include: organization, union recognition, unfair labor practices, collective bargaining, and arbitration.

Law, Language, and Ethics

In this seminar students analyze a series of related issues in legal philosophy: the nature of moral and legal choices, the meaning of responsible human action, the character types needed for various roles in the legal system, and the effect of different conceptions of

human nature on the type of legal system that is considered necessary.

Legal Accounting

An introduction to the processes for recording and measuring financial data relating to the performance of an enterprise, with particular attention to the exercise of judgment in resolving questions in the accounting field. The emphasis throughout the course is on examining the use of accounting techniques in the legal contexts in which a lawyer is likely to confront accounting issues, such as preparation of an employee pension plan based on the "net profits" of the company, or advising a corporation as to how large a dividend can legally be paid to the stockholders. After an introduction to financial statements and the essentials of bookkeeping, the course deals with the principles governing recognition of expenses and income, and the matching of related costs and revenues in measuring financial results. Thereafter, a more detailed study will be made of particular topics of importance, such as inventory, depreciation, and long-term indebtedness. Special attention will be given to the current concern over the development of uniform accounting standards, illustrated by current corporation reports and recent opinions of the official rulemaking bodies of the accounting profession, with the primary focus on the role of lawyers in dealing with these matters.

Legal Process

A critical study of the division of responsibility for the development of legal doctrine among courts, legislatures, administrative agencies, and counsel for private parties, and the resulting roles for lawyers in each of these institutions. Considerable attention is given to evaluating techniques of statutory interpretation in light of the relative positions and capabilities of courts and legislatures. Other topics covered include: the respective roles of courts and counsel in long-term private planning, e.g., percentage leases; the roles of courts, administrative agencies, and legislatures in consumer protection; and the roles of courts, legislatures, and private parties in doctrinal innovation.

Prisoners' Rights

Development of an analytical framework for determining the scope of political and civil rights retained by prisoners, with special emphasis on remedies available to protect these rights. Among the substantive and procedural areas which are discussed are the following: safeguards against unjust administrative punishment; prison censorship and abridgement of other First Amendment rights; protection against psychosurgery and other forms of behavior modification; right to treatment and to job training; right to parole and restitution of full citizenship after release; right to unionize and

bargain collectively regarding conditions of incarceration; media access to prisons; and alternatives to the existing penal system in light of relevant declarations of the United Nations and contemporary theories of the nature and function of criminal law. The course also touches upon the field of civil commitment.

Products Liability, Dignitary and Commercial Torts

An examination of the following topics of tort law: products liability, no-fault alternatives to fault-based liability, dignitary torts (defamation, privacy, intentional infliction of emotional harm), "constitutional torts," and commercial torts.

Professional Responsibility

This is the only required, upper-level course in the School of Law. It focuses specifically on the application of the Code of Professional Responsibility which is crucially important for any practicing attorney and particularly important to a law school which operates under the cooperative plan. The Code of Professional Responsibility is supplemented by text materials and a series of problems.

Real Estate Transactions

The planning and execution of commercial transactions in real property. Particular attention is given to conveyancing, with examination of the rights and obligations of the parties in various types of transfers. Brokerage transactions, the recording acts, land registration, title insurance, mortgages and other financing and security devices are also considered.

Secured Transactions

A study of the law of secured transactions through an examination of Article 9 of the Uniform Commercial Code. The principal features of the Bankruptcy Act relating to security interests are also considered, as well as cases, problems, and general issues of statutory construction.

Securities Regulation

An in-depth study of the securities field and its regulation by government agencies. Areas covered include: concept of the term "security;" issuer concepts; statutory and ordinary underwriter; restricted private offerings to raise capital under Rule 146; public intrastate offerings under Rule 147; public resales under Rule 144 after a restricted private offering; public offerings under Regulation A; economics of a public, versus a private, offering; fraud under 10b-5 and civil liability thereunder; SEC enforcement techniques; broker-dealer fraud and manipulation. Students analyze a public offering prospectus and prepare an appropriate risk factor section.

Taxation of Corporations and Shareholders

An introduction to Subchapter C of the Internal Revenue Code — an exercise in reading a short and difficult statute. Among topics covered are: the taxation of dividends, stock redemptions, liquidations, distributions, and taxable and tax-free sales of corporate stock and assets.

Trusts and Estates I

The devolution of property by gratuitous transfer, whether by will, intestate succession, or gift. The course includes an elementary treatment of the doctrine of estates and rules governing the creation of present and future interests in real and personal property.

Trusts and Estates II

The central focus of this course is on the trust device as a means of accomplishing the devolution and control of property interests. It includes: the creation and enforcement of the trust relationship, an examination of the fiduciary concept, and the problems of trust administration.

Welfare Law

Examines American public assistance as a legal institution. After reviewing the historical, sociological and juridical roots of our welfare system, students examine the laws governing major assistance programs, especially eligibility requirements, rules governing grant determination, work and family rules, and procedural rights. The course then explores methods by which lawyers can deal with the system: advocacy in the administrative process, litigation, legislative reform, and representation of recipient organizations.

Women's Rights

An overview of the applicable constitutional precedents and the Equal Rights Amendment. The course concentrates on those areas in which law can be used as an effective means of preventing sex-based discrimination or mitigating its effects, followed by an examination of current happenings in a series of specific areas, such as employment, control of the body, and tax laws. Much of the material should be useful in dealing with discrimination. Interested students are encouraged to work on drafting legislation, preparing material for actual or possible lawsuits, etc.

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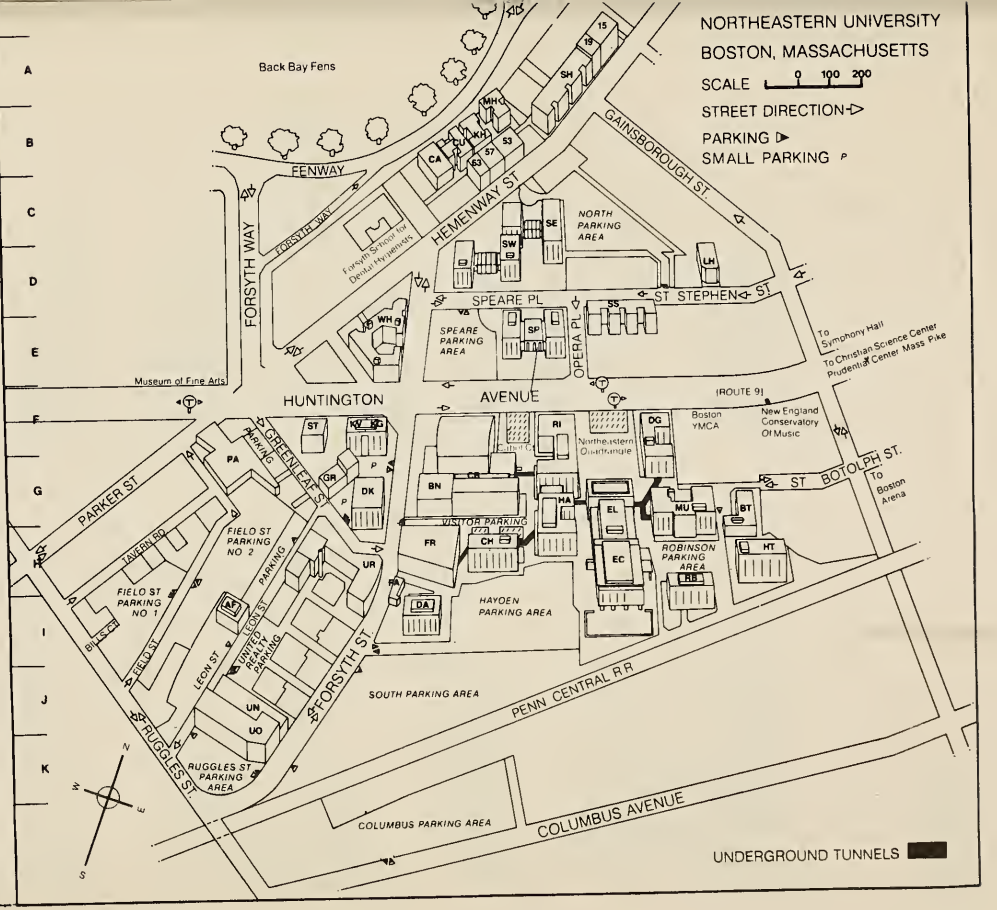
African-American Institute	I3	AF
Barletta Natatorium	G6	BN
Botolph Building	G10	BT
Cabot Physical Education Center	G6	CB
Cahners Hall	C6	CA
Churchill Hall	H6	CH
Cooperative Education Building	F4	ST
Cushing Hall	B6	CU
Dana Research Center	I5	DA
Dockser Hall	G5	DK
Dodge Library	G9	DG
Ell Student Center (Auditorium section)	G8	EL
Ell Student Center (Student Lounge section)	H8	EC
Forsyth Building	H6	FR
Forsyth Building Annex	H5	FA
Greenleaf Building	G4	GR
Hayden Hall	G7	HA
Hurtig Hall	H11	HT
Kerr Hall (Faculty Center)	B6	KH
Knowles Center (Gryzmish Hall section)	F5	KG
Knowles Center (Volpe Hall section)	F5	KV
11 Leon Street	J3	UO
15 Leon Street	J3	UN
Mugar Life Sciences Building	G9	MU
Parker Building	G3	PA
Richards Hall	F7	RI
Robinson Hall	H10	RB
United Realty Building	H5	UR

Dormitories		
115 Hemenway Street	A8	15
119 Hemenway Street	A8	19
153 Hemenway Street	B7	53
157 Hemenway Street	B6	57
163 Hemenway Street	C6	63
Kerr Hall	B6	KH
Light Hall	D10	LH
Melvin Hall	B7	MH
106-122 St. Stephen Street	E8	SS
Smith Hall	B8	SH
Speare Hall	E7	SP
Stetson Hall East	C7	SE
Stetson Hall West	D7	SW
White Hall	E5	WH



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